100 ways to save energy & money in the home

TIPS ON HOW YOU CAN STRETCH CANADA'S ENERGY RESOURCES AND PUT MONEY IN YOUR POCKET

Energy, Mines and Resources Canada
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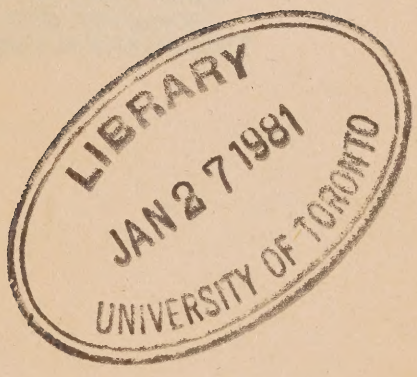

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AND PUT MONEY IN YOUR POCKET

OFFICE OF ENERGY CONSERVATION

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contents

introduction

This book outlines over 100 ways by which you can save energy in your home. Some will produce much larger savings than others, but remember even the little ones add up. Some will require an investment on your part, for instance insulation; others are free, such as night setback of the thermostat or turning off lights. Even those that require a relatively large investment should pay for themselves in a few years and thereafter return perpetual savings, especially as energy costs rise.

Since heating is by far the largest energy consumer in the home, usually accounting for over half of the total household energy budget, let's look briefly at some possible energy savings in this area. Out of all the measures mentioned in the book, furnace maintenance, insulation and temperature setback are probably the most significant. The following chart outlines what could be saved by these measures if your initial annuel fuel bill is $300.

Action	Present Annual Fuel Cost	Saving (%)	Revised Fuel Cost
Furnace Maintenance			
Well-maintained oil-burning furnace	$300	10	$270
Insulation			
Adding additional insulation to ceiling and basement walls ..	$270	20	$216
Adding storm windows and doors, weatherstripping and caulking	$216	10	$194.40
Lower Temperatures			
Lowering daytime temperatures from 72°F to 68°F (22°C to 20°C) and at night to 63°F (17°C) ...	$194.40	15	$165.24

Keep in mind that actual savings will vary according to your climate, heating system, house construction, present amount of insulation, and fuel costs.

It is significant, however, to note that in this example annual fuel costs were cut from $300 to $165 — a saving of $135. By following any of the dozens of other measures related to heating systems, appliances, hot water, lights, cooling and outside equipment, further energy savings and further cost savings can be easily achieved. If one also avoids overpackaging, disposable products and highly processed foods, still larger savings are possible.

Therefore, quite apart from further energy and dollar savings related to the family car, it is quite possible for many families to save more than $100 annually on home energy costs. Some families could stretch these savings as high as $200 if they have large homes that are currently wasting energy.

In addition to financially rewarding the consumer, such savings will conserve Canadian energy sources for future use, lower the tremendous costs of resource development, reduce the environmental impact of energy and help to provide a better quality of life for us all.

A WORD ABOUT THOSE CONSERVATION DOLLARS

One point to watch. If we are all going to save money by conserving energy, we have to be careful how we spend that money. If we turn around and spend it on high-energy products or activities (such as a second car, a heated pool, a snowmobile) we might end up offsetting the energy savings we have made. A good conservation ethic means that we think about the likely energy implications of our purchase decisions.

Try to channel your conservation savings into low-energy investments like paying off the mortgage, further education, music lessons or hobbies, more healthy food, or perhaps even donate it to your favourite charitable cause.

In short put your conservation dollars back into conservation.

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home heating

We can dream all we want about living in the tropical Caribbean. The hard truth is that we live in a country where home heating in winter is essential. And expensive. In a family's energy budget, home heating is the biggest item. It makes sense to save what you can. It's worth understanding how heat is generated, how it's distributed and how it's controlled.

I. GENERATION OF HEAT

Gone are the days when we depended upon wood stoves, fireplaces and even central heating with coal. Most Canadian homes are now heated by oil or gas furnaces, or electric heating of various types.

FURNACES: Some General Hints

First, every furnace should be installed to match the size of the house. Check with a heating contractor to be sure your furnace is the right one for your home. An undersized furnace will burn too much and never really keep you warm. All furnaces should be approved by the Canadian Standards Association, The Canadian Gas Association or the Canadian Electrical Association, and should show the seal of the organization. These seals guarantee that a sample furnace has been tested for safety and meets specific construction standards.

- *The controls* are mounted on or close to the furnace itself. Keep children well away — so they can't accidentally bump the controls and affect the performance of the furnace.
- *Dust* from any source — sawdust, cement dust or lint from a clothes dryer — can affect performance. If the

clothes dryer exhausts into the furnace area, install an outlet filter to keep lint and fluff from getting to the furnace. A nylon stocking stretched over the outlet will do!

- *Air supply.* Above all, remember that oil and gas furnaces need a free and unobstructed supply of air to keep the flame burning efficiently. The furnace room should *not* be airtight. In fact, if you have a small furnace room closed off from the rest of the house, you might consider an air passage to the outside to bring in fresh combustion air.

OIL FURNACES

Most Canadian homes, especially older ones, are heated by oil furnaces. In Quebec and the Maritimes, residential heating is almost exclusively by oil.

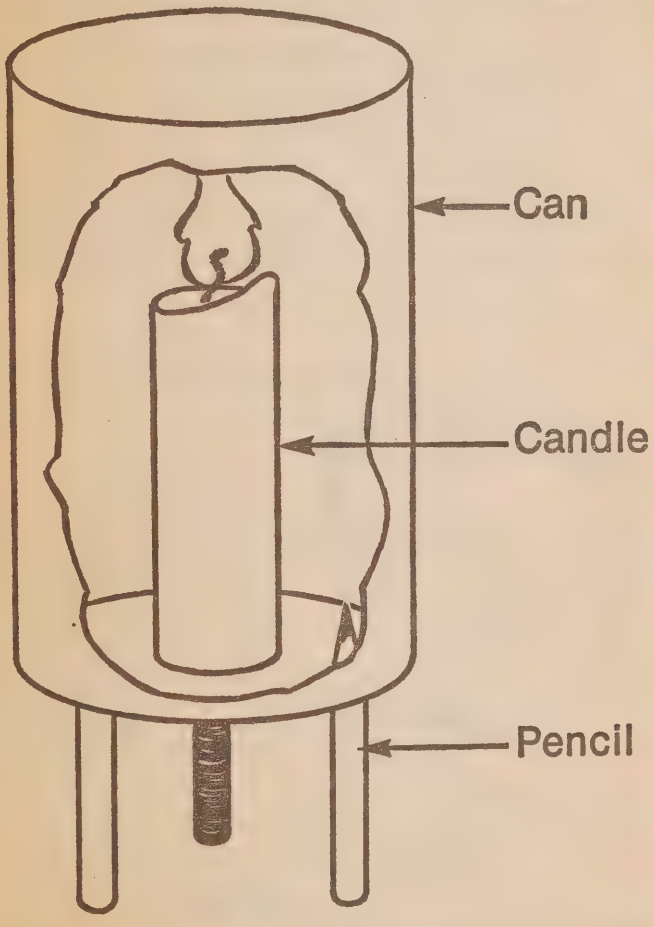
In the conventional oil furnace, heating is accomplished by mixing a spray of oil droplets with air and igniting it to give a flame. To get the most heat, your fuel should be burned completely. The oil-air mixture should use the minimum quantity of air that will give a "clean" flame. Smoke at the tip of the flame will cause soot deposits, and rob you of heat.

HOW WELL IS YOUR FURNACE WORKING? THREE WAYS TO FIND OUT YOURSELF:

The major care of your oil furnace should be left to a qualified serviceman. But there are a few points that you can look after yourself:

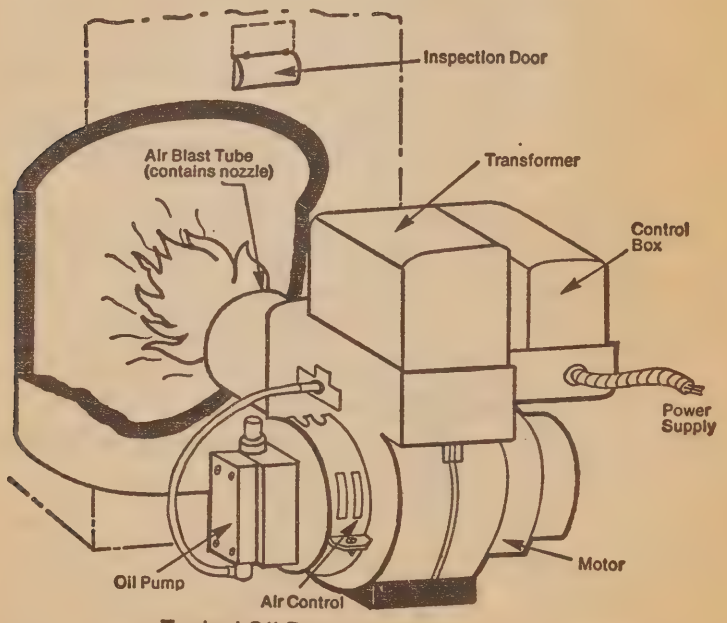
- *Look for a dirty flame.* In the front of your furnace you'll find a flap covering a small hole. You can peek in here to see the flame. (Careful! If your furnace has been on for a couple of minutes the flap will be hot.) Black smoke coming from the tip of the flame is a sure sign that your burner needs adjustment. Call a serviceman.

Imagine a candle burning in an up-ended tin can. In time, the inside becomes black — coated with soot. Since soot is a good insulator, heat on the inside of the can is restricted from flowing outside. The same thing happens inside your furnace. Where does the trapped heat go? Up the chimney instead of into your home. *Cleaning the inside of your furnace takes about an hour and can cut your fuel bill by as much as 10 per cent.*



- *Check for soot.* When your furnace is not operating, take a flashlight and have a look inside the box. How much soot has built up? The more soot, the less efficient the furnace — and the more it's costing you to heat your home. If there's a soot build-up, arrange for an adjustment and cleaning.

  Even with a well-functioning burner there will be some build-up of soot during the winter. This happens when the burner switches on, before the fuel oil is properly mixed with the air. The same thing happens when the burner switches off. You can buy a "clutch coupling" or "solenoid valve" that will help to counteract this. Your serviceman will have the prices and can install either one for you.
- *Check the barometric damper.* In the diagram of the oil-fired furnace (page 31) you'll see the barometric damper on the pipe leading from furnace to chimney.



Typical Oil Burner

This valve bumps open and shut as the wind blows and as the furnace cuts in and out. (Occasionally mistaken for a noisy burglar!) It allows cool air to be drawn from the basement into the chimney, acting as a buffer to keep most of the warm air in the furnace. Check the damper and be sure it's swinging freely.

If it sticks when you push it, clean the hinges and give them a drop of oil. When the furnace is on, check to see that it opens. If it continues to stick in any position, it means you're wasting energy and money. Call your serviceman.

TWICE-A-YEAR SERVICE CAN CUT 10 PER CENT FROM YOUR HEATING BILL

Both furnace and burner should be checked and cleaned twice a year — once in summer and once midway through the winter. This will save at least 10 per cent on your fuel bill. For every $400 you now pay for fuel oil, an efficient furnace-burner combination will save you at least $40.

If all Canadians saved this 10 per cent, Canada would save $90 million and 7.5 million barrels of oil a year. You can see how every drop we save can swell into big savings for the country.

Here are the six important checks your serviceman should carry out twice a year. Make sure he does:

- *Remove soot.* The firepot, heat exchanger and pipes should be completely cleaned. Some experts go so far as to say you should be able to see your reflection in the clean heat exchanger. Tell that to your serviceman!
- *Check stack temperature.* The largest heat loss will be in hot gases going up the chimney. To keep this to a minimum, your serviceman should measure the temperature of the gases leaving the furnace. It should

be between 300°F (148°C) and 450°F (230°C). Often this temperature is over 600°F (316°C). Much too high. It can be reduced by *increasing the speed of the circulating fan.* This usually requires an adjustment of the motor pulley. If this doesn't work — or if you have a hot water or steam heating system — possibly the burner is putting out too much heat for the furnace and you need a smaller oil nozzle.

- *Try a smaller nozzle-size.* Try a nozzle-size 20 per cent smaller, or the lowest firing rate recommended for your furnace — whichever results in the greatest improvement. Your flue gas temperature will drop, furnace efficiency will increase and your comfort level should not change. If you feel cold when the furnace is operating, use a nozzle-size only 10 per cent smaller than the original. Better still, improve the insulation in your house. (See the next chapter.)
- *Check smoke number.* Your serviceman should draw a small amount of stack gas through a smoke density measuring device. In an efficient furnace, the stack gas will be virtually free of soot. If not, the burner should be re-tuned.
- *Check carbon dioxide level.* The amount of carbon dioxide in the stack gas will give a further measure of the furnace's thermal efficiency. Measured in this way, the best efficiency you should expect is about 80 to 85 per cent.
- *Check draft and adjust barometric damper.* Your serviceman should check the draft or draw of air through the firebox and in the stack. The barometric damper should be adjusted if necessary.

There are a number of other checks and procedures which a good serviceman will undertake. Here is a complete check-list. Ask your serviceman to check off all the items on each visit.

(Tear out and hang near your furnace)

Oil Furnace Maintenance Check-List

	SUMMER	MID-WINTER	SUMMER	MID-WINTER	SUMMER
INSPECTION FOR CONDITION AND HAZARD	77	77/78	78	78/79	79
Combustion chamber					
Flue pipe					
a) Connection to furnace ...					
b) Connection to chimney ..					
OPERATE BURNER					
Check for flame character: (using a flame mirror)					
Clean					
Sooty					
Noise					
Check air circulating fan:					
Noise					
FURNACE CHECK					
Disconnect burner/furnace power supply					
Close oil valve at tank					
Dismantle, clean and/or replace oil filter and gaskets					
Remove stack controller, clean					
Remove smoke pipe, inspect and clean interior					
Clean chimney base					

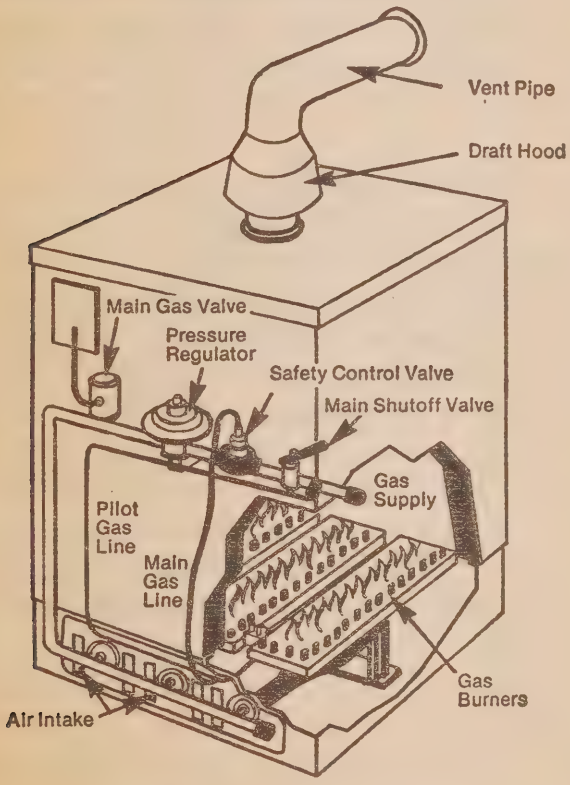
	SUMMER	MID-WINTER	SUMMER	MID-WINTER	SUMMER
	77	77/78	78	78/79	79
Clean furnace internal surfaces					
Replace and reassemble smoke pipe, stack controller and chimney system					
Remove burner:					
a) Check all electrical connections					
b) Clean HT leads to electrodes, check ceramic insulators ...					
c) Clean and reset electrodes ..					
d) Clean fan, fan housing and air inlet control					
e) Replace oil nozzle					
f) Reassemble burner					
g) Open oil valve at tank					
h) Bleed oil line, check and re-set pump operating pressure					
i) Check safety timing on stack relay or cadmium cell					
WARM AIR FURNACE					
Replace/clean air filters					
Check fan belt pulley alignment and mountings					
Clean and lubricate air circulating fan and motor ..					

	SUMMER	MID-WINTER	SUMMER	MID-WINTER	SUMMER
	77	77/78	78	78/79	79
Check winter/summer fan switch					
HOT WATER SYSTEM					
Lubricate circulating pump ...					
ADJUSTMENTS					
Operate furnace					
Reduce air level to give a smoke number of between 0 and 1 ..					
Report smoke number CO_2 level					
Measure stack temperature ...					
Adjust circulating fan speed to give stack temperature between 300°F and 450°F. Discuss reducing nozzle-size with homeowner					
Check and adjust barometric damper					
FINAL					
Inspect all new or remade joints for leakage					
Prove all safety devices					
Clean furnace casing and furnace area, remove garbage					

GAS FURNACES

In a gas-fired furnace, the gas is supplied at a low pressure through the burner head. It then mixes with the air, is ignited, and burns with a blue flame. The burner may have a single head or a multiple jet arrangement similar to the burners on a gas stove. It is vitally important that the air intakes on the sides of the furnace are never blocked, since they allow access for the combustion air.

A valve limits the amount of gas that is provided to the burner and an automatic regulator controls the pressure. The pilot light is on continually and ignites the flame when the burner switches on.



Typical Gas-Fired Furnace

YOU CAN DO SOME OF THE MAINTENANCE YOURSELF BUT FIRST CHECK WITH YOUR GAS UTILITY. (In some provinces maintenance of gas furnaces by unlicensed persons is against the safety code.)

- *Read the manual.* Be sure to read the homeowner's gas utility manual. It will outline many of the following points, and thoroughly acquaint you with your furnace.

Relighting the pilot light

If the pilot light goes out, the safety mechanism should completely shut off the gas supply. First, to be sure that gas will not go to the main burner, put your thermostat to its minimum setting. After checking that the main combustion chamber has been well-ventilated, relight the pilot light. Follow the instructions on a tag or plate attached to the unit.

If you have difficulty relighting the pilot, call your gas utility. All companies provide 24-hour emergency service. Remember, if the pilot light goes out it may indicate that something is wrong with your furnace. Watch it for a time after relighting to see if further repair is needed. The problem could be a malfunction in the gas valve or gas regulator, and a serviceman would be needed.

- *Adjusting flame.* On some gas burners, it's possible to correct an improper adjustment of the primary air nozzle. Before doing so, read your furnace handbook carefully. To adjust the air setting, allow 5 minutes for the burners to heat up. Open the air shutter until the flame lifts off the burner — a sign of too much air — and then close it until the flame returns to the burner. You don't want *any* yellow in the flame.

(Tear out and hang near your furnace)

Gas Furnace Maintenance Check-List

INSPECTION FOR CONDITION AND HAZARD	YEAR				
	1977	1978	1979	1980	1981
Combustion chamber					
Flue pipe					
a) Connection to furnace ...					
b) Connection to chimney ..					
FURNACE CHECK					
Check overall operation of heating unit					
Lubricate fan motor or circulating pump					
Replace disposable type air filter(s)					
or wash and clean permanent filter(s)					
*Instruct householder how to clean filter during winter operation					
*Clean main burners and adjust flame					
*Clean and adjust pilot burner					
Check fan and limit controls ..					
*Check pilot safety cut-off					
Inspect chimney clean-out					

*Checks to be carried out by serviceman.

(Tear out and hang near your furnace)

Gas Furnace Maintenance Check-List

INSPECTION FOR CONDITION AND HAZARD	YEAR				
	1977	1978	1979	1980	1981
Check winter/summer fan switch					
Clean exterior of furnace					
Replace fan belt when necessary					
*Check thermostat for proper operation					
*Measure stack temperature ...					

*Checks to be carried out by serviceman.

- *Summer shutdown.* If you live in a new house that has a dry basement and a flue-lined chimney, you can save gas by shutting off the pilot light for the warm summer months. On a yearly basis, the pilot light consumes about 10 per cent of your total gas consumption. If you're in an older home, check with a heating contractor. Summer condensation could cause rust in the furnace or mortar damage in an unlined chimney.
- *Fall start-up.*
  (a) Light the pilot light if you've had it off for the summer.
  (b) Turn up the thermostat until all burners are lit. Check that you're getting an even flame, without smoke. It should be blue, with no sign of yellow. Adjust the air setting and if this doesn't help, call the serviceman.
  (c) Follow the steps outlined in the next section on heating systems — warm air, hot water or steam — to put your house in order for a winter of efficient heating.

FURNACE SERVICE MAINTENANCE

A well-functioning gas furnace should have a thermal efficiency of 78 per cent. To maintain this, an experienced serviceman should inspect it once a year. Check with your gas utility. If they don't have the staff, they'll recommend someone to you.

- Be sure that only properly qualified and licensed personnel work on your furnace. There are strict safety regulations for natural gas operation, and in most provinces the service employees must be registered with the provincial government.
- The serviceman should carry out the checks indicated.

ELECTRIC FURNACES

In Canada there are now a few instances of central electric furnaces, with an electric element providing the heat source. There is little maintenance that can be carried out on these units; maintenance of their associated distribution systems are covered in the following section.

HEAT PUMPS

The heat pump is a new heat source for both residential and commercial use. It's basically a refrigerating machine which takes heat from a low-temperature source (outside air) and delivers it inside the house at a higher temperature. For one kilowatt of power consumed, the system can produce the equivalent of about three kilowatts of heat in the house. It could be three times more efficient than electric resistance heating.

Heat pumps are now being evaluated for the Canadian winter, and with some modifications may come into wide use. The initial cost is high, but they may prove to be very useful and economical heat sources.

Summer bonus: Another advantage of the heat pump is the fact that it's a cooling system in summer. Once the thermostat has been set, the pump will automatically heat or cool the house to keep that temperature.

II. HEATING SYSTEMS: DISTRIBUTING THE HEAT

It's one thing to produce heat efficiently, but that's only part of the battle. The next important topic is *moving* it to where you want it.

There are four basic types of heating systems:

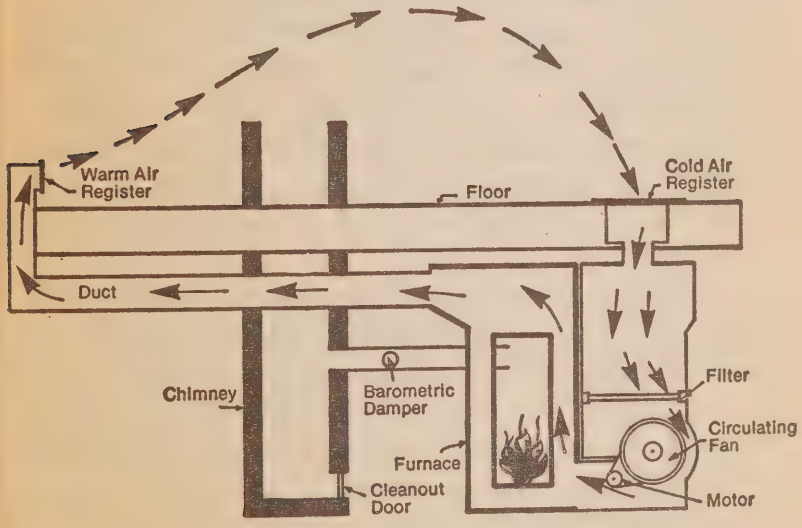
1. *Warm air.* Air is heated and then circulated through the house with the help of a fan or by gravity.

2. *Hot water.* Water is heated and pumped through pipes and radiators.
3. *Steam.* Water is boiled to produce steam which then circulates through pipes and radiators.
4. *Electricity.* Electricity is supplied directly to each room in the house and supplies heat through heating elements and radiators.

WARM-AIR HEATING

This is the most common system in Canada. Cool air is drawn from the house through the cold-air registers. It is filtered and a fan forces it over the heat exchanger where it picks up heat from the firepot. It then circulates in ducts to air registers throughout the house.

- *Be kind to your circulating fan.* The fan usually starts after the burner, and is controlled by a thermostat that measures the temperature of the air in the heat exchanger. You'll notice that the fan often keeps running after the burner has cut out. Air is



Typical Warm Air Heating System (oil fired)

still being heated; energy in the furnace would be wasted if it shut down right away. The warm-air temperatures at which the fan cuts in and out are easily set by a control switch on the front or side of the furnace.

- *Watch the temperature.* The serviceman usually sets the fan to cut in at 175-200°F (80-93°C) and out at 140-150°F (60-65°C). This is a high range. To extract more energy from the furnace, set the fan to cut in at 120°F (49°C) and out at 100°F (38°C). The fan will start to circulate the hot air sooner and will run longer after the thermostat has cut off the burner.

  For the last minute or so of fan operation, the circulating air may feel a little chilly to someone sitting close to a register. You want the best setting for your needs and may prefer the cut-out temperature higher than 100°F (38°C).
- *Lubricate the fan motor.* Give it a squirt of oil two or three times during the heating season.
- *Check belt tension and alignment.* There must be proper alignment between the pulleys of the electric motor and the fan. Belt tension is also important. These items should be included in your annual servicing, but you can check them yourself as well. (The diagram of the warm-air heating system shows you the location.)

  Before you do *anything,* turn off the master power switch. Oil the motor and then check the belt tension. It should have ¼" to ½" play mid-way between the pulleys. If the tension isn't right, loosen the adjusting screws holding the motor frame to the motor housing. Slide the motor until the tension is right. Tighten the screws — and check to be sure you didn't disturb the alignment of the two pulleys.

To increase the flow of warm air through the house, increase the fan speed by adjusting the variable diameter pulley on the motor.

- *Change the filter.* Go back to the diagram to find your filters. Usually they're at the back of the furnace, behind a panel. *Inspect them at least once a month.* If they are dirty, replace the disposable fiberglas type or wash out the semi-permanent type. (You might try vacuuming the disposable type and using them again.) Dirty filters block the circulation of air, reduce the furnace's efficiency and cost you money.

  You'll find disposable filters in your hardware or department store. The sizes are marked, such as 16 x 20 x 1". The filters fit on ledges behind the back door of your furnace and installing the right size is important. Some of the semi-permanent ones can be cut to size and washed out once a month. (But do it in *cold* water, please!)

- *Insulate duct work.* If you don't need extra heating in your basement, all the exposed ducting should be taped at each joint and insulated with fiberglas or mineral-wool insulation. (*Warning:* Never use foamed plastic insulation because it's a fire hazard.) Flip to the chapter on insulation for more help with insulating ducts.

- *Don't block warm-air registers.* A warm-air register can be accidentally blocked by simply dropping a newspaper on it. The warm air that should be coming into the room will go elsewhere, and your furnace will have to work overtime. If the registers are under a window and you happen to close the curtains or drapes in front of them, the warm air merely heats the window. What a waste! So be sure to keep re-

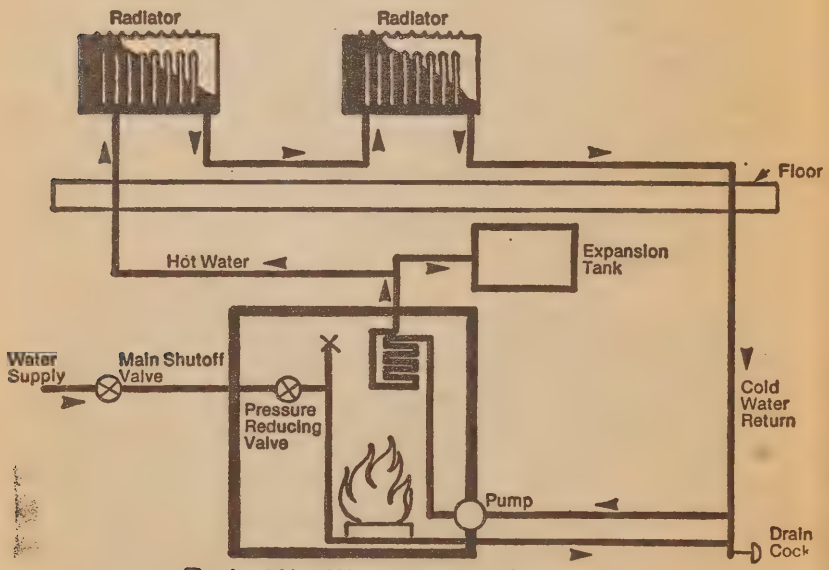
gisters clear of such heat-robbers as curtains, drapes, furniture and carpeting.

- *Fit plastic deflectors.* Almost any hardware will have plastic deflectors for hot-air registers. They shoot the heat away from the cooler outside walls and into the main living area.

HOT-WATER HEATING

This is the most common alternative to warm air. Water is pumped through tubes in the furnace and heated to a maximum of 180°F (82°C), then circulated through the house in pipes. After giving up heat to the radiators, the cooled water returns to the pump and starts the cycle all over again.

The system always has an expansion tank and pressure relief valve to prevent excessive pressure build-up. A flow-control valve stops the water when the circulating pump is not working.

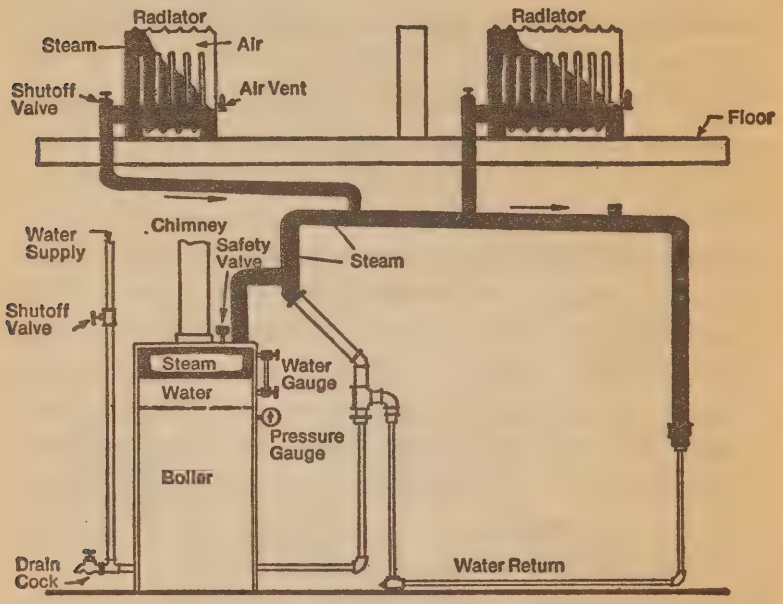


Typical Hot Water Heating System

- *Keep an air space in the expansion tank.* The expansion tank has an automatic water feed. Relief valves should be checked and the water drained off to provide an air space for expansion of the heated water. Different systems use slightly different methods to restore the air cushion in the tank, so look in your owner's manual for these instructions and the location of drain taps.
- *Insulate hot-water pipes.* Hot-water pipes going to and from radiators should be well insulated, especially in areas that don't need heat.
- *Check water level in the boiler.* To run efficiently, the system needs water in all radiators and in the boiler. Each fall, before start-up, check your water-level gauge on the boiler.
- *Bleed air from all radiators.* In the fall, when your system goes on for the first time, bleed the air from each radiator. If you don't, air will stop the water flow and the radiators will stay cold. Open the vent screw at one end of the radiator and keep it open until hot water spurts out — hopefully into a handy cup or glass. You'll need a screwdriver or small wrench to open the vent, and when you're finished, be sure the water isn't dripping.
- *Keep radiators clean and free of obstructions.* Wipe away dust and dirt to let more heat out. Don't set bookshelves, chairs or drapes directly in front or on top because they also slow up the heat flow. Let the heat out at both top and bottom.
- *How not to paint a radiator.* Stay away from metallic paints and glossy light colours. Use a matte or satin finish.
- *Try a reflector.* A sheet of aluminum foil against the wall, behind the radiator, will direct the heat into the room.

STEAM HEATING

This is found mainly in older homes and is similar to the hot-water system, but uses steam at 212°F (100°C). Water is heated to boiling in a boiler, and the steam rises through pipes to radiators in each room of the house. Here the steam is condensed to water, releases heat to the room, and returns to the boiler by gravity.



Typical Steam Heating System

- *Check water level and flush out boiler.* Water in the boiler should be kept at the level recommended by your manufacturer. Check the glass gauge usually found on the boiler. If there isn't enough water in the system, the heating unit will shut off; too much water will reduce the boiler's efficiency. Once a month through the heating season, flush out and clean the boiler. Open the "flushing" valve (find it with the

help of your instruction manual) and drain the water until it runs clear. Then refill the boiler to its proper level.

- *Check the system for steam leaks.* If you have leaky joints, both steam and heat will escape. Repair them yourself or call a plumber.
- *Insulate the pipes.* The chapter on hot-water heating shows you how to do it.
- *Check the radiators often.* If you find one that's cold, look for faulty air valves or vents on the steam mains or on the radiator itself. Adjust, repair or replace immediately. *Read the earlier section on hot-water heating for tips on radiator care.*

ELECTRIC HEATING

Despite the fact that electricity is converted into heat with virtually 100 per cent efficiency in the home, don't make the mistake of concluding that electric heating is 100 per cent efficient. It's not.

Total system efficiency depends upon how your electricity is generated — from falling water, oil, coal or nuclear energy. This varies from province to province, and even by days of the month and hours of the day. For example, if your electricity is generated by an oil-fired generating station, its efficiency of production is between 35 and 40 per cent. Add in the line losses and we discover that electric home-heating based on this system is actually less than 35 per cent efficient — lower than oil or gas used directly in the home furnace. On the other hand, in some provinces — Quebec is one — which rely primarily on hydro-electric power, the efficiency is higher. But because of the initial loss at the generating station and further loss during transmission, it is still not 100 per cent when the electricity reaches the home.

In future, as the economical hydro-electric sites are all harnessed, the growing demand for electricity will be met more and more from thermal generation stations burning oil, natural gas or coal, or powered by nuclear generation.

Earlier we talked about electric furnaces and heat pumps. Here, we'll deal with electric heat provided by baseboard heaters, fan-forced and wall-mounted convectors, and heating cables. You can do quite a few things to improve the efficiency of these systems:

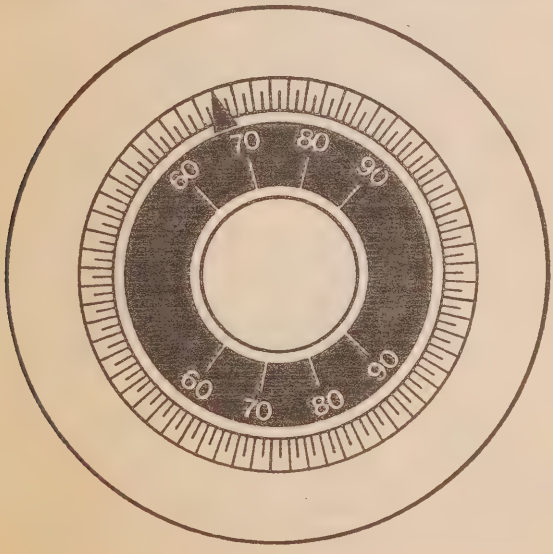
- *Clean heaters.* Before the heating season, and now and then through winter, take a vacuum cleaner to the heaters. A build-up of dust can quickly reduce heat transfer.
- *Aim the heat.* Check that the proper deflector has been installed for the wall-mounted convectors. Warmed air should be directed to where it will deliver maximum efficiency.
- *Remove blockages.* Be sure that outlets aren't blocked by furniture that will prevent free circulation of air. And if you have baseboard heating, don't let window drapes cover the unit or you'll do little more than warm the glass.
- *Radiant heating coils.* In many new houses, heating cables have been installed in the ceilings and sometimes in the floors. These need even more insulation than baseboard heating. You should occasionally spot-check the ceiling or floor with your hand to be sure you're getting a good even heat. If not, the problem could be a broken cable.

III. HEATING CONTROL AND COMFORT

We've had a look at heat production and distribution. Now let's talk about controlling your heat levels — for both winter comfort and fuel efficiency.

YOUR THERMOSTAT

- *What's the best location?* Is your thermostat on an inside wall free from window and door drafts? Does it record the *average* temperature in the house? If not, think about moving it. Be sure it's away from radios, television sets, lamps or other heat-producing units that might cause a false reading and shut off the furnace before the proper temperature is reached. If it is near such appliances, don't turn up the thermostat; move the lamps, TV sets, etc.
- *Try a lower temperature setting.* Daytime summer temperatures are often in a range from 60-65°F (15-18°C). Quite comfortable. Yet in winter many of us insist that we can only be comfortable at 70°F



(21°C) or higher. Give it a try at 68°F (20°C). If someone in the family feels a little chilly, suggest a sweater. Don't turn up the thermostat for one person!

Heat is money. Look at what you can save.

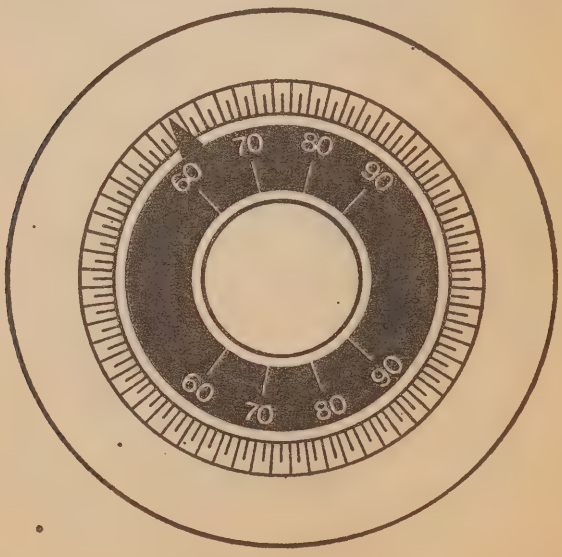
For each Fahrenheit degree above 68°F your fuel consumption goes up an average of 2½ per cent.

If you permanently lower your thermostat setting from 72°F to 68°F (22°C to 20°C) you'll save about 10 per cent on your fuel consumption.

Look at it in dollars. If you now spend $300 a winter on heating, a 10 per cent saving on fuel saves you $30.

It could be a little more or less, depending upon your insulation, local weather conditions and the cost of fuel.

- *Set it back at night.* For an even bigger saving, drop your thermostat by 5°F (about 3°C) at night.



Sleep and save

Each degree of night-setback saves 1 per cent over an 8-hour period. Lowering your temperature from 68°F to 63°F (20°C to 17°C) will save about 5 per cent or $15 a year.

You'll probably want an extra blanket on the bed. If you'd rather use an electric blanket, along with the lower temperature, you'll still save energy. It costs less to keep *you* warm than the whole house.

Most doctors will tell you that it's healthier to keep the temperature down.

For those who forget, or can't face the thought of stepping out of bed onto a chilly floor in the morning, there are thermostats on the market which will automatically lower the temperature at night and raise it again in the morning just before you get up.

Combined savings: Could you use an extra $45?

If your present temperature is 72°F (22°C) all the time, and you lower it to 68°F (20°C) during the day and cut it back another 5°F (3°C) at night, your combined saving could be 15 per cent. That's $45 on an annual fuel bill of $300.

Could Canada use an extra 12 million barrels of oil and 40 billion cubic feet of natural gas?

That's how much we could save annually right across Canada if everyone followed the combined savings plan above. In dollars, it adds up to a saving of about $200 million a year for Canadian consumers. Quite a windfall!

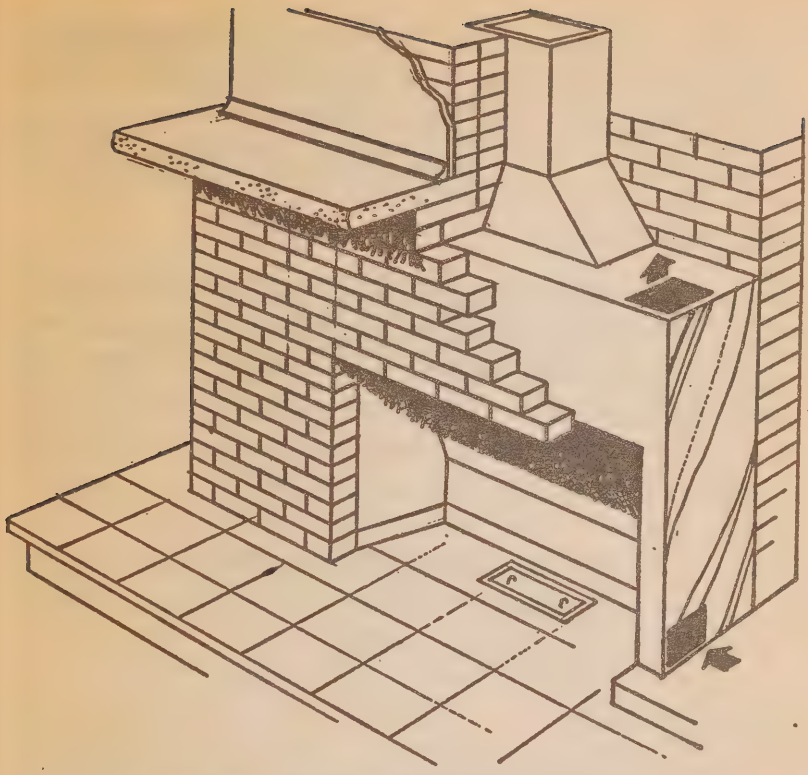
- *Lower the temperature when you're away.* If everyone is at work or in school during the day, or if you're away for the weekend, set the thermostat to about 63°F (17°C). It doesn't make much sense to

keep the furniture warm. When you come home, set the thermostat for the temperature you want — not higher. The furnace can only produce so much heat at one time. Turning it up high will *not* speed up the heating process.

- *Zone controls.* Most electrical heating systems offer a degree of "zone control", with different sections of the house controlled by separate thermostats. If you have a room or area that isn't occupied, turn down its thermostat and close the doors leading to it.
- *Don't heat unused rooms.* With warm-air systems and water or steam distribution, it's usually possible to shut off the flow of heat to certain areas. If you have a room that isn't being used — guest room, basement, pantry, garage — shut off all or most of its heat and close the door. Send your heat to where you really need it.

FIREPLACES

- *Close the damper.* A crackling fire makes a room cozy, but what happens when the fire dies out? If the damper is left open, warm room-air shoots up the chimney. *Just as soon as the fire is out, close the damper.* Take a flashlight and make sure it fits tightly. If it doesn't, fix it yourself or call a repairman.
- *Seal off an unused fireplace.* If you have a fireplace that's never used, close it up by putting a plug of some sort in the chimney, or across the fireplace opening.
- *Be sure you have proper venting in a new fireplace.* If you are buying a new house with a fireplace, or are having one built, insist that hot and cold air vents be installed at each side of the fireplace. These vents will take out most of the heat that would otherwise escape up the chimney.



FIREPLACE WITH HEATING VENTS

Heating benefits can be gained from a fireplace that has warm-air outlets. The air, which is drawn through vents at the bottom, is heated as it rises and then can be discharged through outlets at the top, either into the room where the fireplace is located, or can be passed through ducts to other rooms.

DRAPES

Drapes or curtains — especially lined ones — help to insulate windows and stop drafts.

- *Close drapes at night.* In winter, as soon as the sun has gone down, pull your drapes to help keep the warm air in the room. If you don't, it will move outside by both conduction and radiation.

- *Let the winter sunshine in.* The sun's warmth is free and can help to heat up a room. So keep the drapes open during the day. (In summer, of course, do the opposite.)

EXHAUST FANS

- *Use fans as little as possible in winter.* Each time you turn on a kitchen or bathroom exhaust fan in winter, warm air goes out and cold air is drawn in to replace it. Take a minute to make sure the filter in your kitchen fan is clean. This will move out the odours and smoke more quickly, so you can shut it off sooner.
- *Don't let cold air sneak in.* Be sure the flap on the outside vent closes tightly. If you don't use the fan at all, seal it up for the winter.

HUMIDIFIERS

A humidifier puts moisture back into the air and increases the comfort in our centrally heated houses. Very low humidity irritates nasal tissue, and dries out both skin and furniture. A reasonable level of humidity can overcome these problems, and help to conserve energy by cutting down on evaporation from your skin. High rates of evaporation make you feel cool.

- *Add a reasonable level of humidity.* Use either a furnace-fitted or room humidifier.
- *Don't add too much water.* Remember that it takes heat to evaporate water, so don't overdo it. Also excess humidity will only bring on window condensation. Some humidifiers have a control that shuts off the unit as soon as the proper level of humidity is reached.

keeping the heat in

We might as well forget about trying to heat up the great Canadian winter; we just can't do it. So let's keep our heat indoors, where it will do us the most good. This chapter deals with a number of ways to hold onto precious heat:

Insulation
Storm-windows and doors
Weatherstripping and caulking
Some other chilly problems

I. INSULATING YOUR HOME

Why should I insulate my home?
Is it only a new house that can be insulated — or can more be added to an older home?
Can I do it myself or do I need a professional?

As you read this section you'll discover that installing or adding insulation is neither difficult nor particularly expensive. Insulation conserves heating energy which in turn saves you money.

Step-by-step instructions and drawings show you how to fit insulation into a wall, over a ceiling, or under a floor. Special problems are dealt with: how to insulate an attic, or what to do about a cold basement or sealed-up walls.

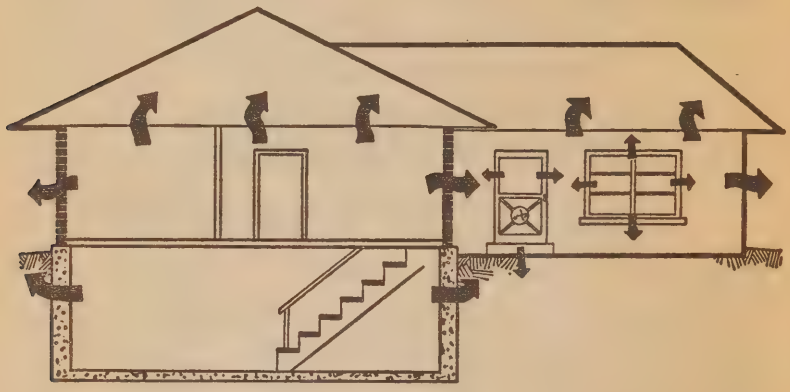
WHY INSULATE?

Two things happen when insulation is added to your new or existing home. First, and most important, you

save energy because you use less fuel for heating. Secondly, you feel warmer and more comfortable.

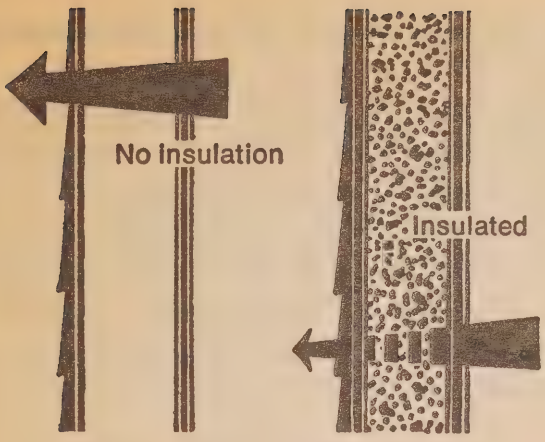
Savings

From the moment heat is generated, it tries to escape into the colder air outside. It vanishes through the ceiling walls, sneaks out around windows and doors. The rate of escape depends on the difference between the inside and outside temperatures, and on the resistance it meets. Insulation is the key barrier that traps and holds heat inside.



A thorough re-insulation job can cut your annual heating bill by as much as 50 per cent. A more modest improvement to your insulation can save you 20 to 30 per cent annually. So if your bill is now $300, a 30 per cent saving could reduce it to $210. The cost of insulating all or part of a house is usually paid for in 5 years or less, through lower annual heating costs.

A quick way to find out if your house needs extra insulation is to take a look outside. On a dull day, is the snow melting on the roof? If so, you don't have enough insulation in the attic. Is snow disappearing from around the sides of the house? If so you need insulation on the basement-walls.



HERE'S HOW HEAT ESCAPES
FROM YOUR HOUSE

Comfort

A poorly insulated house is usually uncomfortable. Blame it on the "cold wall" effect. The inside surface of an uninsulated wall may be from 8 to 15 Fahrenheit

degrees (4 to 8 Celsius degrees) colder than the same wall with insulation. If you're sitting near the wall, your body heat will flow towards the cooler surface and you'll soon begin to feel chilly. At the same time, as warm air meets the cool wall it becomes more dense and sinks towards the floor. This displaces warm floor-air which rises. The result can be uncomfortable drafts.

Many of us turn up the thermostat, blaming a chilly feeling on the furnace or the weather. The real problem is often a lack of good insulation and weather protection.

WHAT IS THE "R" VALUE?

Years ago we assumed that the best measure of insulation was *thickness.* Times and products have changed. This rule-of-thumb is no longer reliable.

Insulation is now manufactured and sold by *"resistance value"* (called the "R" value) — a precise measurement of the insulation's resistance to heat transfer. The higher the resistance value, the less heat will escape through the insulating material. The following chart shows the resistance value of some better-known building materials. Notice that one inch of polyurethane, rated at 5.88 R value, heads the list.

One brand of insulation may be thicker or thinner than another, but if they both show the same R value, they'll perform equally well. The R value is stamped in large letters on the cover of packaged insulation. If it isn't there, check with your dealer who should know the value.

Calculations using the R value

Let's say you decide to check the R value of the insulation in the walls of your home. Suppose it is

RESISTANCE VALUE OF BUILDING MATERIALS

Building Material	Thickness (inches)	R Value
Insulating fibreboard	1	2.38
Insulating sheathing	⅝	1.49
	½	1.19
Plywood	1	1.25
	½	0.63
Gypsum board	½	0.32
Hardwoods (maple, oak, etc.)	1	0.91
Softwoods (pine, fir, spruce, etc.)	1	1.25
Western Cedar (18 per cent moisture content)	1	1.56
Loose-fill insulation Cellulose fibre	1	3.57 to 4.00
Mineral fibres (2.0 - 5.0 lbs density)	1	2.5 to 3.33
Vermiculite (expanded mica 7.0 lbs density)	1	2.08 to 2.50
Batt-type insulation (fiberglas or rock wool)	2 - 2½	7.0
	3 - 3½	10.0
	6	20.0
Expanded polystyrene ("Beadboard")	1	3.45 to 4.0
"Styrofoam"	1	5.00
Polyurethane	1	5.88 to 6.0
Flooring	¾	0.68
(Hardwood)	⅜	0.34
Air space in walls	¾ to 4	0.97
Brick (clay or shale)	4	0.42 to 0.44

RESISTANCE VALUE OF BUILDING MATERIALS (Cont.)

Building Material	Thickness (inches)	R Value
Concrete block (3-oval core, sand and gravel)	4	0.71
	8	1.11
	12	1.28
Cinder block	4	1.11
	8	1.72
	12	1.89
Inside airfilm resistance		0.68
Outside airfilm resistance		0.17

Note: R values may vary for the same thickness and type of insulation due to manufacturers' variations.

brick construction with 1″ plywood under the brick, 2½″ of batt-type insulation, a 1½″ air space, and ½″ gypsum board on the inside. Write them down:

Material	Thickness (inches)	R Value
Brick	4	0.42
Plywood	1	1.25
Batt insulation	2½	7.0
Air space	1½	0.97
Gypsum board	½	0.32
	Total	9.96

The total resistance of your wall is about R10. Notice that the insulation is by far the largest factor.

Suppose you decide to recheck the insulation in your attic and find there are 3½″ of batt-type insulation with an R value of 10.0 (assuming that the insulation

has retained its full insulating properties over the years). Let's say you want to double this R value to 20. Looking at the table, you have 3 choices:

(1) a 3″ layer of batt-type insulation
(2) 2½″ of cellulose fibre loose fill (with an R value of 4.00 per inch)
(3) 4″ of vermiculite (with an R value of 2.50 per inch)

Any of the three, combined with what you now have in the ceiling, will give you a total R value of 20.0. And cut heat loss through your ceiling by 50 per cent.

TYPES OF INSULATION

You can choose from four basic types of home insulation:

(1) batt and blanket
(2) loose fill
(3) rigid foam plastic
(4) foamed-in-place plastic

(1) *Batt and blanket insulation*

This has a soft, woolly texture and is made from fibres of glass, rock or slag. It is the most common type and is probably up in your attic right now.

The batts are sold in pre-packaged bundles, in 4-foot or 8-foot lengths. They vary from 2 to 6 inches in thickness and come in standard widths — to fit snugly between uniform centre ceiling joists, studs or wall strapping.

Blanket insulation is sold in rolls of varying lengths, widths and thicknesses.

Both types are sold with or without an attached vapour barrier. This barrier is a protective coating on one side of the insulation — using wax, tarred kraft paper, aluminum foil or plastic — to guard against

moisture damage which would reduce the insulation's effectiveness. (Vapour barriers and their uses are discussed again further on.)

Batts or blankets are used to insulate frame or brick houses — in walls, over ceilings, under floors, in crawl spaces and garages. They can be used on poured concrete and block basement walls where framing has been applied.

(2) *Loose-fill insulation*

Loose-fill insulation is sold by the bag and may be in pellet, fibrous or granular form. When properly used, it leaves few air gaps or pockets and forms an effective heat barrier. In wall cavities, however, it may settle over the years and leave a poorly insulated gap at the top.

There is no vapour barrier, so one must be applied to protect the insulation from moisture. (Because loose fill is so easy to apply it's often used to re-insulate an existing home ceiling. Professional insulation contractors also use it as a "blown-in" type for the wall cavities of existing homes. Holes are drilled in each stud space of the wall and the insulation is blown in using a compressor. The holes are then sealed.)

Loose fill is manufactured from glass, rock, slag, pulverized paper or expanded mica. Insulation poured into the block cores of block-type walls in new construction is *not* especially worthwhile because the connecting ribs act as "heat bridges".

(3) *Rigid foam plastic insulation*

Rigid polyurethane and polystyrene insulation are sold in panels of different sizes and thicknesses. They offer several advantages: high insulation value with minimum thickness and weight, rigidity, sound absorption, vapour barrier.

Warning — fire hazard!

Polyurethane and polystyrene foamed plastics are now recognized as severe fire hazards when used in exposed or semi-exposed applications. As now manufactured, they not only contribute to flame spread, but produce explosive and poisonous gases under fire conditions. They should not be used in applications which might expose them to open flame inside a building.

Foam plastic insulation can still be used under these conditions:

(a) inside, if covered by ¾" plaster or ⅝" gypsum board
(b) on the *outside* of concrete, masonry or wood frame walls
(c) inside masonry cavity walls, suitably fire-stopped
(d) under concrete floor slabs
(e) as roof insulation applied *above* structural deck

(4) *Foamed-in-place plastic insulation*

There are several brands of foam insulation, mainly urea-formaldehyde, which can be foamed-in-place in wall cavities. (Polyurethane should *not* be foamed into an *enclosed* cavity.) Urea formaldehyde should be installed only by a professional contractor with proper equipment and considerable experience.

Problems have arisen with some contractors who do not apply the product properly; therefore choose a reputable company and ensure that a meaningful guarantee is provided. Make sure that any product you use meets quality standards.

THE VAPOUR BARRIER

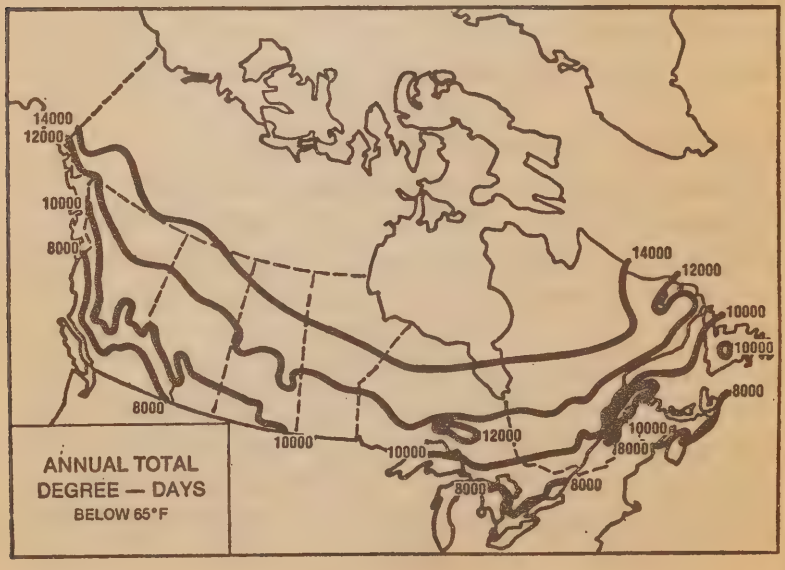
Vapour barriers are an essential part of the insulation story. Insulation in a wall, ceiling or floor must be protected by a vapour barrier applied to the warm (heated) side of the insulation. Without it, moisture from the house air will enter the insulation, condense and cause serious damage.

Some insulation is sold with an attached vapour barrier. Others require a separate application. Here are some common vapour barrier materials:

Polyethylene film
Aluminum foil
Aluminum paint
Varnish and rubber base paints
Urethanes

RECOMMENDED INSULATION LEVELS

The recommended insulation levels for Canadian homes have been rising through the years, reflecting



increased heating costs and concern for energy conservation. The precise level of insulation which can be justified on economic grounds (cost of insulation vs. fuel saving) varies with climate, fuel costs, insulation prices and other factors. It is possible, however, to recommend one set of *minimum* insulation levels which are generally applicable across the country.

The recommended levels for existing and new housing will differ because current construction practices often limit the amount of insulation that can be added. However, innovative construction techniques will allow higher levels for new housing in the future.

EXISTING RESIDENCES:
RECOMMENDED MINIMUM INSULATION LEVELS

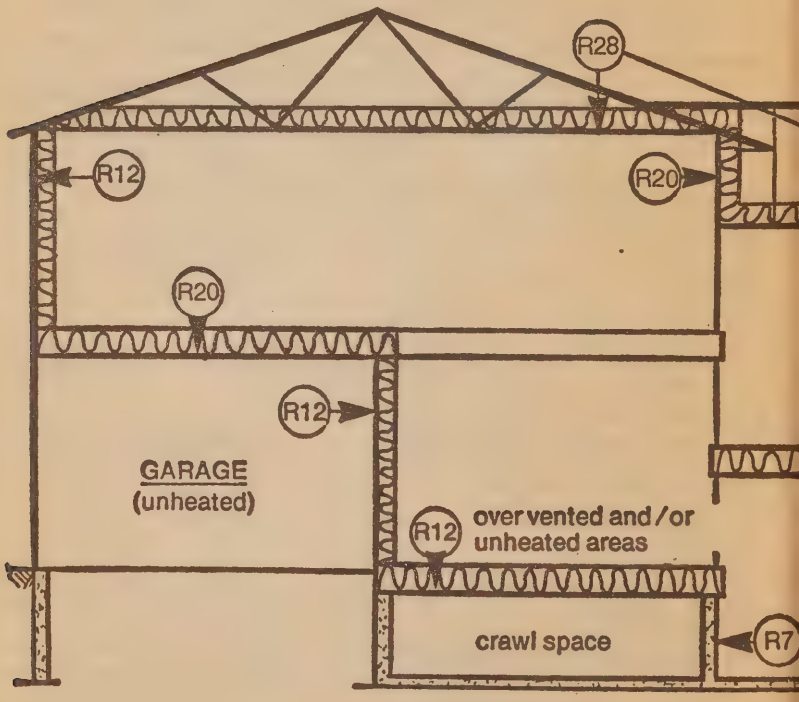
	R Value of Insulation Only	Inches of Fiberglas or Rock Wool	Inches of Loose Insulation
Ceilings	28	8	8 to 10
Walls	12	3½ to 4	4
Basement walls less than 50% exposed	7 to 8	2 to 3	2 to 3
Basement walls fully exposed	12	3½ to 4	4
Floors over unheated garage, crawl space or overhang	20	6	—
Floors over unheated basement	12	3½ to 4	—

Notes:
1. The construction techniques used in your home may prevent you from achieving these insulation levels. Go as far as you can within your budget.

2. For the required amount of such insulating materials as foamed plastics, urea-formaldehyde etc., refer to the previous chart on R values.
3. If you live in a moderate climate, say Vancouver or Victoria, check your local building codes for more specific guidelines.
4. In every case, check your local building or electrical codes to see if they recommend higher values. If they recommend *lower* ones, they're probably out of date.

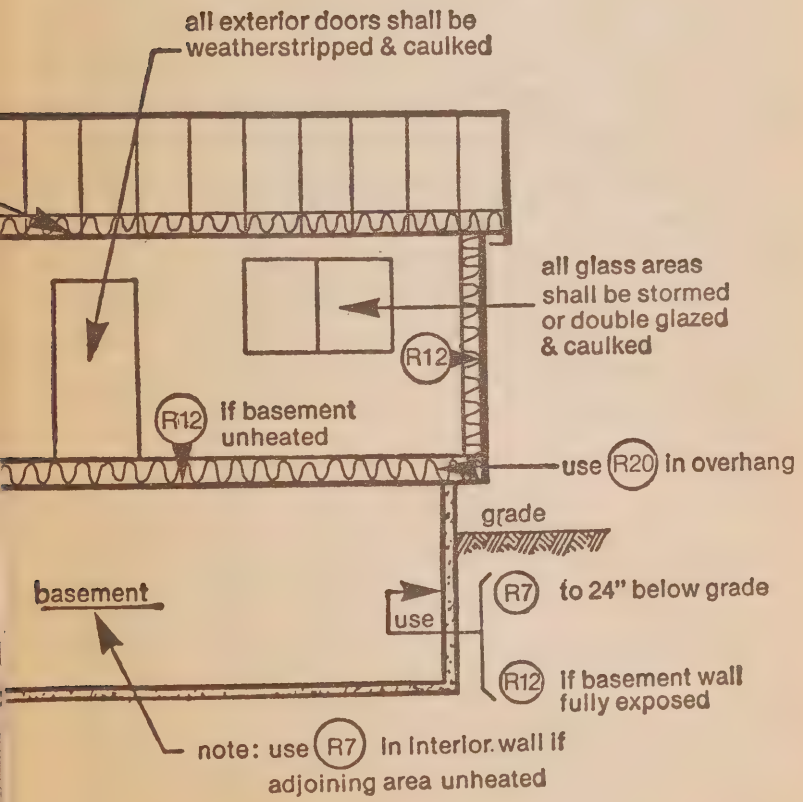
New Housing

The building codes for new homes are presently being re-evaluated and updated to meet today's energy circumstances. New construction techniques, such as 6-inch wall studs and exterior insulation, are being con-



sidered to make new houses suitable for the energy pinch ahead. Even solar heating systems are being developed and tested.

When you buy or build a new house, be sure it has the maximum amount of insulation possible. You might want to look into 6-inch wall studs to permit more insulation in the walls, and consider built-in basement insulation. Your new home should at least meet the insulation levels recommended above. The money you invest in extra insulation now will more than repay itself in the years ahead.



THE VALUE OF ADDED INSULATION

How much money can you expect to save on heating by re-insulating various parts of your house? The two charts below, from *Canadian Homes Magazine,* will give you a guide to your savings.

There are separate tables for bungalows and two-storey houses because the proportion of heat lost through walls and roof is quite different in each case. Since walls are more expensive to insulate than ceilings, the difference is important when you are determining the value of added insulation.

Both types of houses are assumed to have about 2½ inches of insulation in the ceiling and no insulation in the walls. If your house has more than that, then you won't achieve as much reduction in heating costs as is shown in the tables. The tables can still be used, however, to estimate the benefit of any added insulation.

To use the tables, first select the appropriate one for your house style — bungalow or two-storey — then look along the top line of figures to find the annual heating cost that is closest to your own. Then follow down this column to see how much money you can expect to save each year if you put in the amount of insulation noted.

POSSIBLE SAVINGS FROM ADDED INSULATION

2-Storey House

Based on typical CMHC 2-storey house built more than 20 years ago, with 2½" of insulation in the ceiling but none in the wood frame or brick walls. Basement walls 1/3rd above ground.

PRESENT ANNUAL FUEL BILL	$500	$465	$435	$400	$365	$335	$300	$265	$235	$200
CEILING R7	$	$	$	$	$	$	$	$	$	$
Plus 2½" batts (R7)	30	28	26	24	22	20	18	16	14	12
Plus 6" loose wool (R14)	40	37	35	32	29	27	24	21	19	16
WALLS INSULATED AFTER CEILING										
With 3½" blowing wool (R7)	137	127	119	109	100	91	82	72	64	55
With 3½" UF foam (R15)	170	158	148	136	124	114	102	90	80	68
With 1" Styrofoam plus drywall (R5)	92	86	80	74	67	62	55	49	43	37
BASEMENT WALLS										
With 2" (R6) foamboard (beadboard)	21	19	18	17	15	14	12	11	10	8
With 3½" batts (R10)	25	23	22	20	18	17	15	13	12	10
MINIMUM ANNUAL FUEL BILL	$265	$247	$230	$212	$194	$177	$159	$141	$124	$106

POSSIBLE SAVINGS FROM ADDED INSULATION	Bungalow Based on typical bungalow more than 25 years old, with 2½" of insulation in the ceiling but none in the wood frame or brick walls. Basement walls, concrete, 1/3rd above ground.										
PRESENT ANNUAL FUEL BILL	**$420**	**$390**	**$360**	**$330**	**$300**	**$270**	**$240**	**$210**	**$180**	**$150**	
CEILING R7	$	$	$	$	$	$	$	$	$	$	POTENTIAL SAVING
Plus 2½" batts (R7)	46	43	40	36	33	30	26	23	20	17	
Plus 6" loose wool (R14)	63	59	54	50	45	41	36	32	27	23	
WALLS INSULATED AFTER CEILING											
With 3½" blowing wool (R7)	93	86	80	73	67	60	53	46	40	33	
With 3½" UF foam (R15)	112	104	96	88	80	72	64	56	48	40	
With 1" Styrofoam plus drywall (R5)	53	46	43	39	36	32	29	25	21	18	
BASEMENT WALLS											
With 2" (R6) foamboard (beadboard)	42	39	36	33	30	27	24	21	18	15	
With 3½" batts (R10)	48	45	41	38	34	31	28	24	21	17	
MINIMUM ANNUAL FUEL BILL	**$197**	**$182**	**$169**	**$154**	**$141**	**$126**	**$112**	**$98**	**$84**	**$70**	

Example 1: If you have a minimally insulated bungalow and your heating costs are presently $300 a year, you can save $45 a year by adding another R14 of ceiling insulation.

After that has been done, you can save another $67 a year by putting 3½ inches of blowing wool in the walls. Insulating the basement walls with 2 inches of foamboard will save an additional $30 a year on your heating bill. Remember that this foamboard should be covered with plaster or gypsum board.

Example 2: If it presently costs you $335 a year to heat a two-storey house with 8 inches of insulation in the ceiling but none in the walls, you can save as much as $114 a year on your heating costs by having the walls insulated with 3½ inches of urea-formaldehyde foam.

Work out your saving from the table shown. To determine the cost of the insulation, and installing it, check your local prices. These vary from place to place. You can then find out how long it will take you to pay off this investment at current fuel prices. But remember that fuel costs are likely to go up, so insulating *now* becomes an even better investment.

It may take several years but — as the tables clearly show — in addition to increased comfort, added insulation pays off in dollars and cents.

HOW TO INSULATE

A few tips before you start

Almost all insulation is lightweight and easy to handle. Few tools are needed, but care should be taken when you're working with mineral fibre-type insulation. Small insulation particles can cause skin irritation and

itching. It's a good idea to wear gloves. And a shower at the end of the day will wash away particles left on the skin.

When you're ready to start in the attic area, pull on a pair of running shoes and watch your step. Walk only on the ceiling joists. Most ceiling surfaces under the joists are plastered; too much weight will puncture the ceiling. Boards laid across the joists will give you a sturdy working platform.

To cut batt or rigid insulation use a sharp penknife or blade. Lay the insulation on a flat surface and cut to make the flanges as shown in the diagram below. Any accidental cuts in the vapour barrier should be taped before the insulation is finally applied.

A heavy-duty staple gun is essential for applying batt insulation. You should be able to rent one from your insulation supplier or hardware store.

Measure your walls and floor and attic area carefully. Once you've decided on the R value you need, talk over your requirements with the dealer. He'll help you figure out the right number of bags or bundles of insulation. It's bulky, so have it delivered. Store it in a dry place until you're ready to start to work.

The ceiling is first priority

Since warm air naturally rises and tries to escape, the ceiling is a major source of heat loss. Fortunately it's the easiest place to add insulation. It deserves first priority for re-insulation (or "retrofitting") an existing home or insulating a new one.

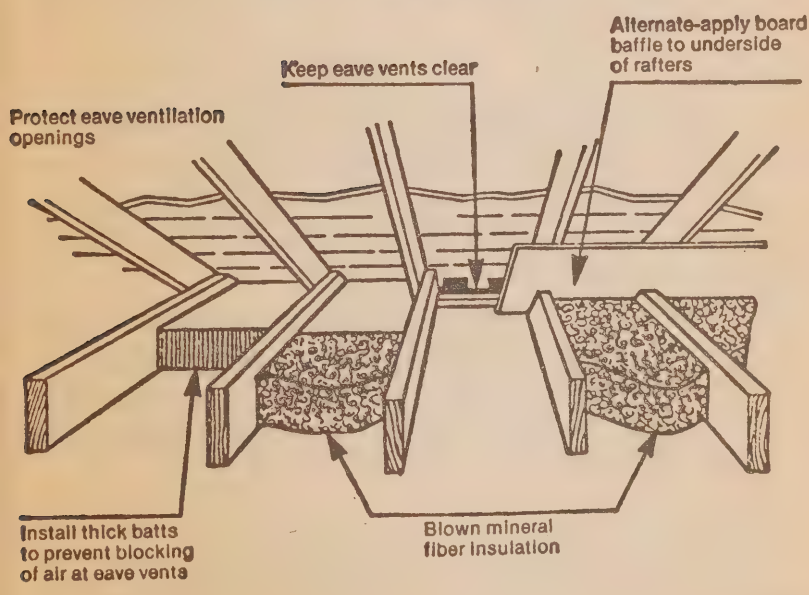
Good ceiling insulation will return fuel savings of between 10 and 30 per cent depending on house type and existing insulation.

- *Retrofit.* First, find out the condition and depth of insulation already in your attic. Some older homes have none; most have a small amount — a 2-inch or 3-inch mineral fibre batt — and this may have settled or become water damaged.

  You should have a ceiling R value of 28 or more, which means at least 8 inches of insulation. If you have less than that – say a 3-inch batt – you should upgrade it in one of two ways:

  (a) Add a further 5-6 inches of batt or blanket insulation. You don't need a vapour barrier because there should be one already on the ceiling. Buy insulation that comes without the barrier. When you lay the insulation, be sure that all areas are covered except, of course, for the eave vents and other ventilators. (Note: *Never* apply attic insulation with vapour barrier up).

ATTICS



(b) You can also use bags of loose fill. Pour it between the ceiling joists, then use a garden rake or a pusher (made from pieces of 2 x 2″ and 2 x 6″) to smooth and settle the insulation into all the corners. The fill should at least cover the top of the ceiling joists — higher if more thermal resistance is required. Check the R value per inch printed on the bags. Again be sure not to block the vents.

If there's no insulation and no vapour barrier in your attic, install one before insulating. In this case plastic sheeting laid between the joists and fitted snugly down to the ceiling board would be best.

- *New homes.* The ceiling in a new home or extension should be insulated to at least R28. This means at least 6 inches of batt, blanket or loose-fill insulation, and an effective vapour barrier on the lower (warm) side of the insulation. The extra cost of a good insulation job will more than pay for itself over the life of the house.

Walls

Your walls are the second most important source of heat loss. Aim for a total wall resistance of R14 or more. This means an R factor for the insulation of at least 12, about as much as can be achieved with batts or blankets and 4-inch wall studs.

- *Retrofit.* Unfortunately re-insulating walls is more difficult and more expensive than ceilings. You do have a number of options, however, depending upon the type of wall construction, existing insulation and money to spend.

(a) *Wall renovation (frame walls).* If your plans permit extensive renovation, remove the wall-

board or plaster and re-insulate the wall as you would a new one (see instructions below). Then replace the wallboard. While you're at it, you might want to attach 1 x 2″ or 2 x 2″ strips to the stud edges to allow for more insulation in the wall cavity.

(b) *Inside insulation (frame or masonry walls.)* To avoid the trouble of removing the inside surface of a wall, or when this can't be done as with masonry walls, you can apply new insulation (batts, blankets or rigid panels) to the inside surface. Apply straps to the wall to attach the insulation and covering wallboard. (Remember that polystyrene should be covered by plaster or gypsum board.) You can use 1 x 2″ furring strips for thin styrofoam; use at least 2 x 2″ strips for batts, blankets or thicker foam. Once your strips are in place, apply the insulation according to the instructions below for frame walls.

(c) *Blown-in insulation (frame walls).* If you have hollow, or almost hollow, wood-frame walls you can have a professional insulation contractor blow in loose-fill insulation. He can do this from the outside if small sections of the exterior can be removed, as with clapboard. If the exterior is brick, aluminum siding or stucco, he'll have to drill holes in the interior walls and repair them when he's finished. Care must be taken that the *entire* stud space is filled — that no projections or cross-braces hinder the filling process.

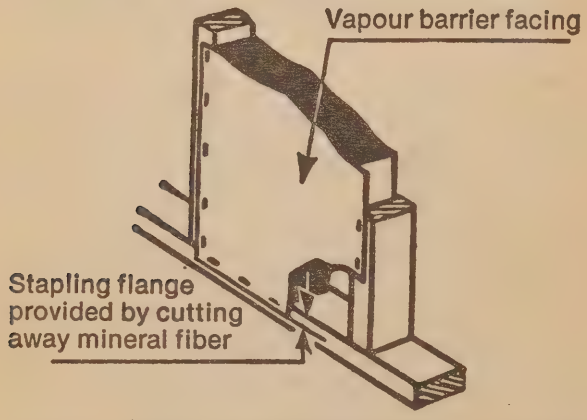
(d) *Foamed-in-place insulation.* The cavity in older wood-frame houses and in some masonry walls can be filled with a foamed-in-place insulation.

This must be done by an experienced professional. Check both the product and the workmanship and make sure you get a meaningful guarantee.

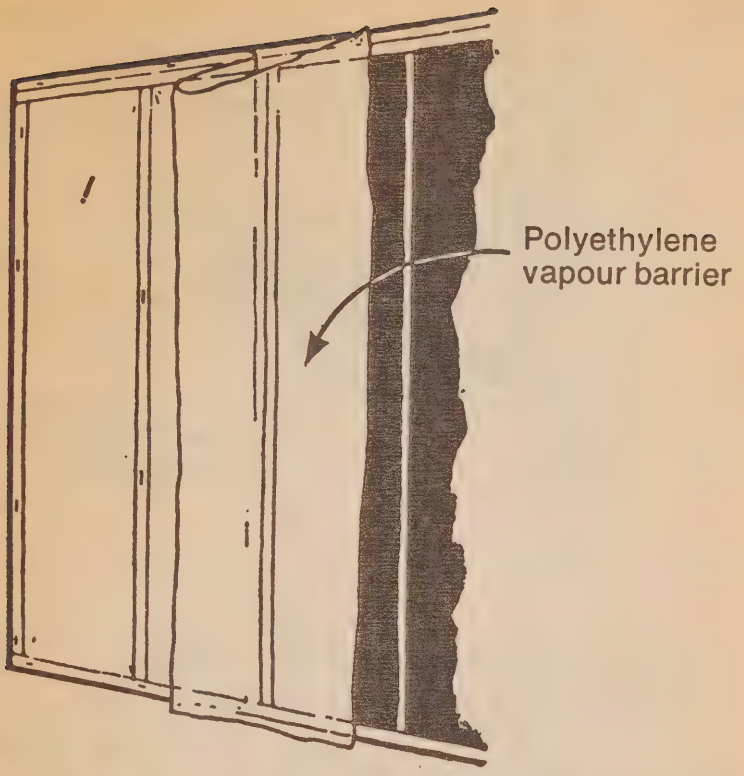
- *New walls.* When you're insulating new walls, the idea is to put in as much insulation as the stud space will accept. For extra insulating value, consider 6-inch studs or a layer of styrofoam sheating on the outside (under the exterior surface). Follow the instructions below.

Instructions for insulating framed walls

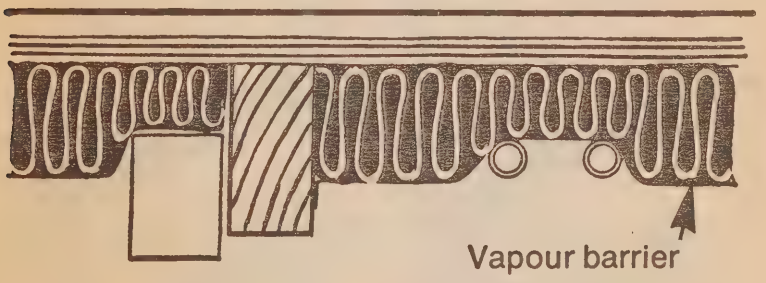
When you start to work on a wall that has been framed, push blankets into the stud spaces so they touch the sheathing or siding. Work from the top down and place the staples about 12 inches apart, pulling down the flanges so that they fit snugly against the top and bottom plates.



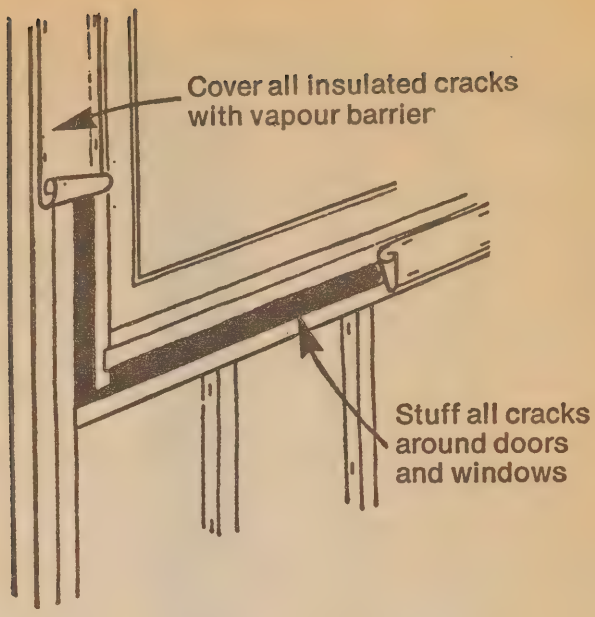
If you're using friction-fit batts or blankets without an attached vapour barrier, first wedge them into place, then cover the inside face of the wall with a suitable vapour barrier such as polyethylene, stapled to top and bottom plates. Unroll the sheet across the entire wall area, including window and door openings. You can cut these out later.



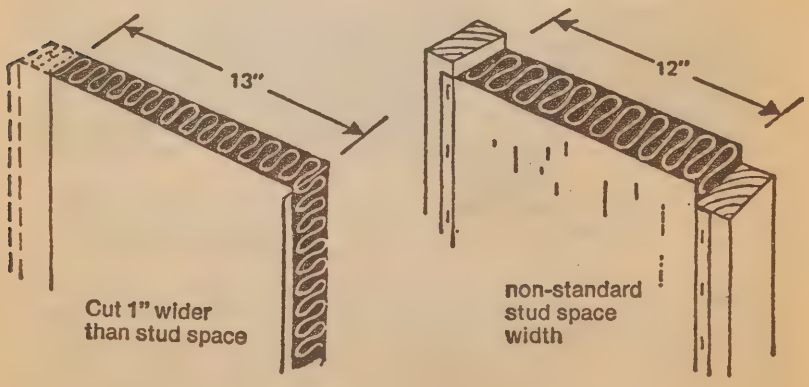
Be sure to fit insulation behind pipes, ducts and electrical boxes. Pack the space with loose insulation or cut a piece to the proper size and fit it into place.



Stuff pieces of insulation between rough framing and door and window heads, jambs and sills. Staple vapour-barrier paper or polyethylene to cover these small areas.

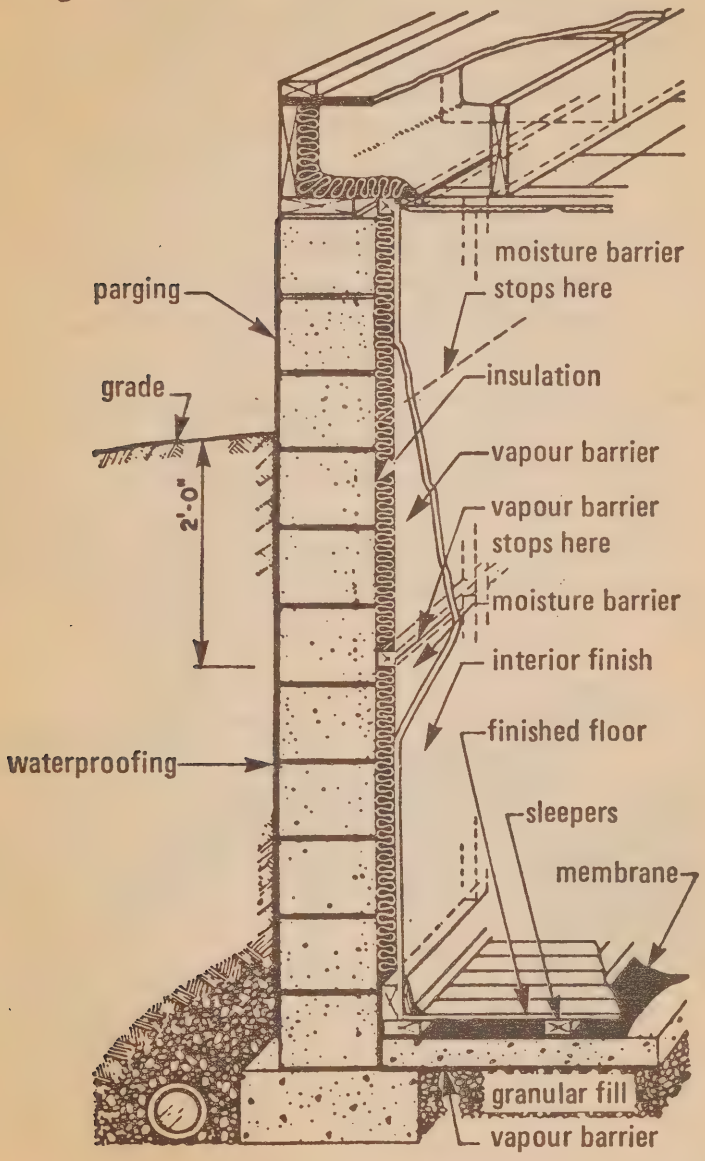


If you have non-standard-width studs or joist spaces, cut the insulation and vapour barrier an inch or so wider than the space to be filled. Staple uncut flanges as usual. Pull the vapour barrier on the cut side to the other stud, fitting the insulation behind it, and staple through the vapour barrier to the stud. Unfaced blankets are cut slightly oversize and wedged into place.



Basement walls

After plugging the heat leaks in ceilings and walls, basement walls are the next area to tackle. A good deal of heat is lost from basement walls, especially the part above ground.

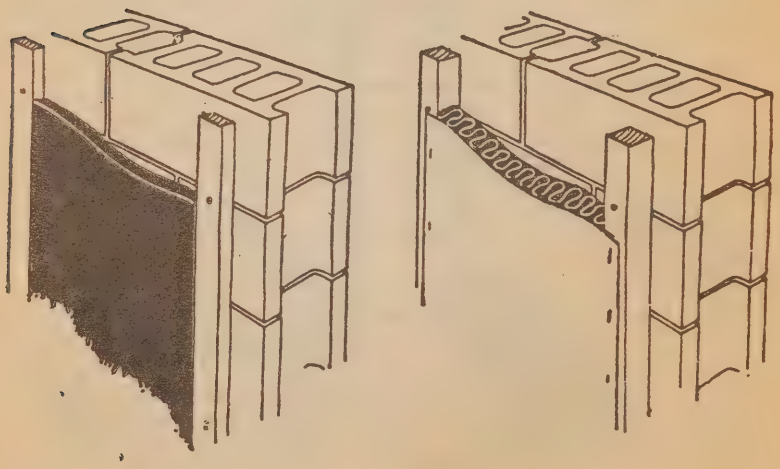


For block or concrete walls that are less than 50 per cent exposed, you should add insulation with a resistance value of R7 or R8 to at least 2 feet below grade. For fully exposed basement walls, insulate as you would an upstairs wall — R12. In all cases, apply a moisture-proof coating to the wall before insulating.

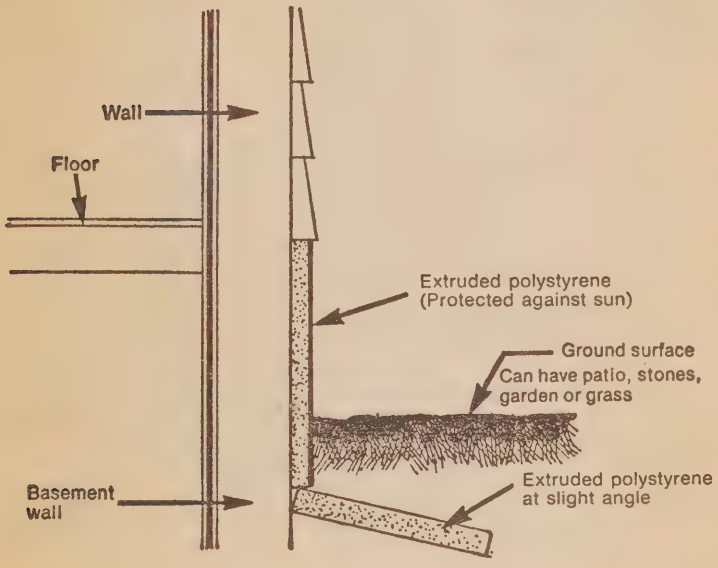
- *Retrofit.* There are two ways to insulate a basement wall: inside and outside.

  (a) *Inside insulation.* You can insulate masonry walls by first strapping them with 1 x 2″ furring strips, 2 x 2″ strapping or a 2 x 4″ frame, depending on the thickness of insulation needed. These straps can be placed on 16 or 24″ outside centres, depending on the thickness and type of wall finish. Remember that foam insulation should be covered with plaster or gypsum board.

  When you've completed the strapping or framing, refer back to the earlier instructions for insulating framed walls. You can use R7 batts with 2 x 2″ strapping by compressing them slightly; however this reduces their insulating value to about R6.



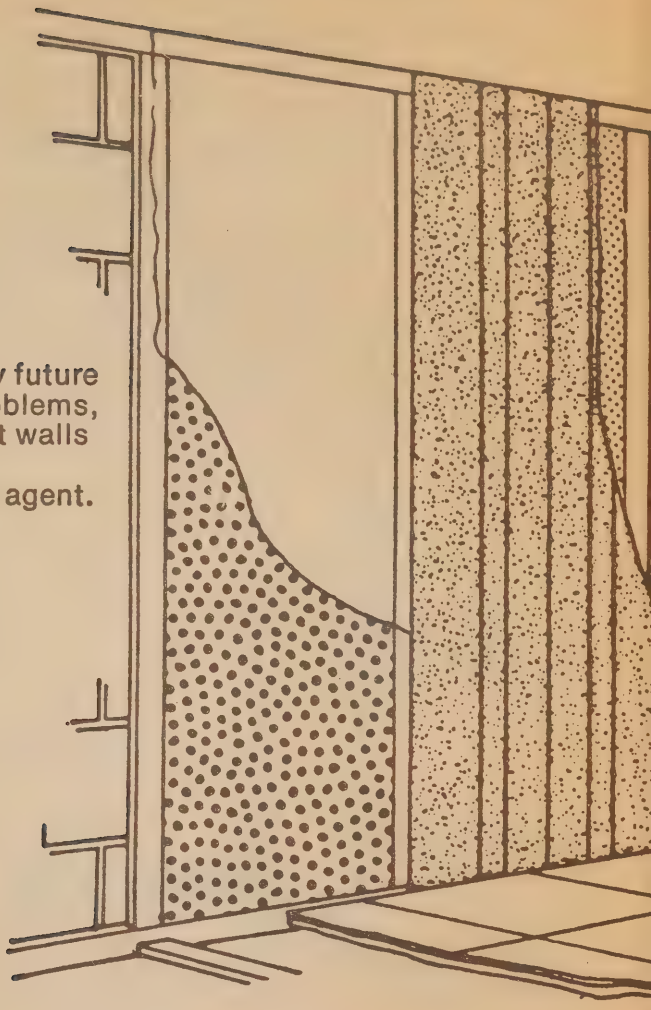
(b) *Outside foam insulation.* It has been shown that basements can be insulated effectively and easily by applying *extruded* polystyrene about 2 inches thick to the outside of masonry walls. Above ground the foam should be securely stuck to the wall, protected at the top from water seepage and coated with paint or another covering to protect it from the elements. Below ground it's quite adequate to use a horizontal slab, at a slight angle to drain away water. This slab can be covered with patio stones, grass or a garden. It acts as an effective heat barrier for the lower wall. In fact, this type of exterior insulation can be just as effective as interior applications.



Solving the cold basement problem

Basements are naturally cold and damp since most of their wall area is below the ground level. However, much can be done to add warmth to a basement recreation room.

Where space is limited — or wa
strapping is impractical, consid
rigid insulation.

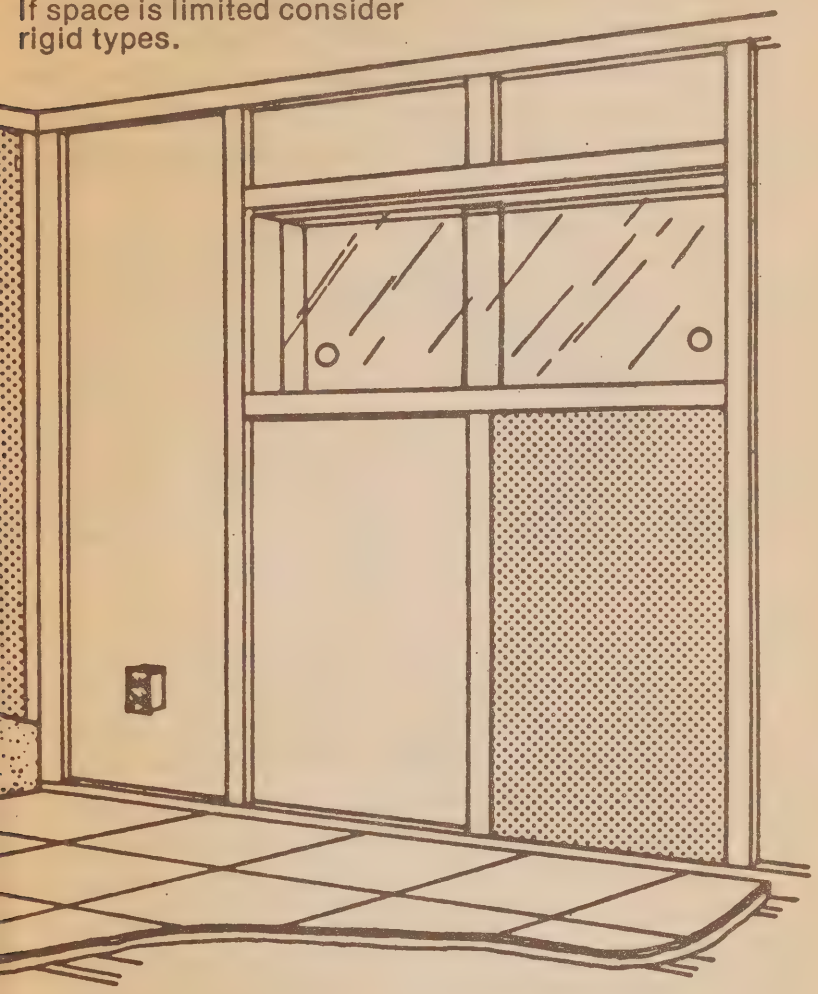


To combat any future dampness problems, coat basement walls with a good waterproofing agent.

To warm cold floors consider a subflooring, covered with carpeting or carpet tile. A cold air return to the furnace will help remove static cold air from floor level. If basement has a fireplace — keep damper tightly closed

Insulation around window should be snug fitting.

Compressing batt type insulation may nullify the "R" value. If space is limited consider rigid types.



Outside walls should be insulated and storm windows added. A sub-floor overlaid with tile or carpeting will help to overcome the chilly floor problem. Any door into a cold room or cellar should be fully insulated.

The composite cut-away sketch of one corner of a basement recreation room shows how insulation is applied to the walls and around windows, and how the sub-floor is laid. Don't forget to damp-proof the walls before you begin.

You may find that even with adequate insulation, your recreation room is still on the chilly side. Perhaps your heating system lacks the capacity to put heat into the room. Cold air lying static at floor level will chill the feet and make your basement room seem colder. To help the furnace do a better job, be sure that a cold-air return leads from the basement room back to the furnace. This will allow the cold air to leave the floor area and be replaced by warmer air.

Floors

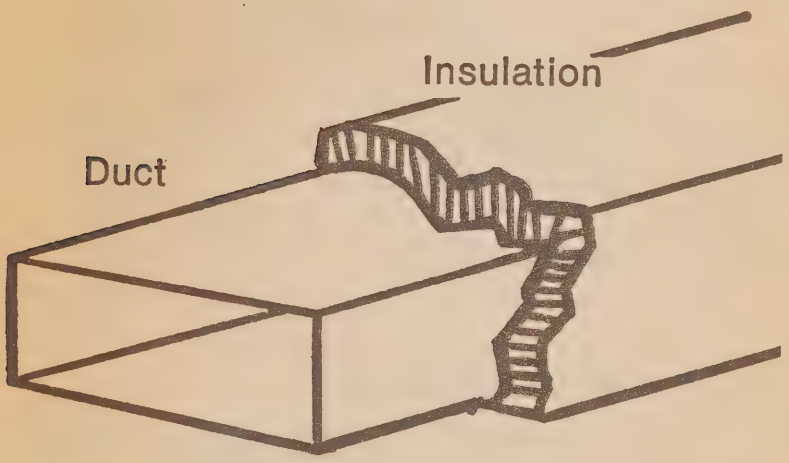
Floors over unheated crawl spaces, garages and projections should have at least R12 insulation. In most existing homes, insulation of open floors is easily accomplished with batts installed from below. Be sure to secure the batts with wire mesh or cross-braces. And remember to put the vapour barrier up, to the warm side.

The roof of the garage may be a floor for a second-floor room that is already covered in. To upgrade insulation here, use batts or blankets. These can be held snugly to the garage ceiling with either a light lath support or chicken wire.

A word about insulating ducts

In the previous chapter we mentioned that heating ducts should be insulated in cool basements. Here's

how. First, tape up the joints to prevent leakage. Then take 2 inches (or more) mineral-fibre batts or blankets and cut to size. Lay the insulation along the bottom and tape in place. Then do the sides and top, being sure to tape the corner joints. If you're using batts, put the vapour barrier on the outside for neatness.



II. WINDOWS AND DOORS

The windows and doors in your home can be responsible for 25 per cent of your heat loss, even more if they're poorly fitted.

A single pane of glass has an R value of about 1. So it loses about 12 times as much heat as the same area of properly insulated wall. Adding double glazing or storm windows will double the resistance and cut heat loss in half — but it's still six times the equivalent wall area.

Uninsulated doors are another big source of heat loss — especially if your kids leave them open.

How much energy do you waste through single-pane windows?

Let's suppose the outside temperature is a chilly 20°F (−7°C) and that it's cloudy so that your windows are not letting in radiant heat from the sun. If you keep your thermostat set at 70°F (21°C) and you have an average 200 square feet of single-pane windows, you lose over 11,000 Btu per hour, just through the glass. You could halve this loss by fitting double panes or storms, and save 1 gallon of heating oil or 128 cubic feet of natural gas each day — that represents a dollar saving to you of from 15 to 35 cents *every day!*

STORM WINDOWS AND DOORS

- *Use double glazing.* When you're replacing windows, install double glazing — either two separate panes or the bonded type. If you live in an extremely cold area think about *triple* glazing, especially on windows facing north.

- *Install storm windows.* If you have single-pane windows, adding storms will cut your heat loss in half.

  The modern storm window is designed to be left on year-round; you can open both panes in summer and the window is equipped with a screen.

  In older homes the storm-window frames are usually made of wood. If you have this type, put them on in fall *before* you start using your heating unit. Remove them in spring. If you have air conditioning throughout the house, leave the storm windows on year-round. The air space between the two panes of

glass provides the insulation and keeps the house at the temperature you want. Be sure there is a space, otherwise it will be the same as one thick pane of glass.

- *Plastic storms.* For windows that are not used for the view, you can install plastic sheeting attached to the inside or outside window frames.

- *Use insulated doors.* All outside doors should contain insulation rather than hollow spaces. Many moderately priced homes have outside doors made of a light wood frame covered with plywood or a similar material. A light door doesn't give much protection against the cold. When the temperature is below 20°F (−7°C), and the sun is away from the door, feel the inside of the door with your hand. If it's much cooler than the walls near the door, consider putting on a storm door.

- *Install storm doors.* Well-fitting storm doors will cut heat loss and prevent chilly drafts.

  A storm door can easily be mounted by the average homeowner, but be sure to take the measurements of the door frame before you head out to buy the door. They come in different sizes and you don't want to waste gasoline making two trips to the store when one would do!

  The best storm doors also have a screen so your house won't be invaded by summer insects when you want fresh air. Talk over your needs with the service manager or salesman at the store. He can help you choose the right type and size. You might also pick up some tips on installation.

Before you start the actual installation, read the instructions that come with the door. Find a second pair of hands to help you. Once the door is in position, make the final adjustments to level it and ensure that the flexible strip across the bottom (usually made of rubber) makes a good seal. Now you can laugh at cold winds blowing your way.

III. WEATHERSTRIPPING AND CAULKING

Both you and your furnace need some fresh air coming into the house — also to clear out odours and moisture. This is called infiltration and most Canadian homes have too much. In fact, up to 25 per cent of your heat loss can be due to excess infiltration around windows, doors and other cracks. These drafts not only cost you money but can make your home unpleasant through winter.

How far should you go in sealing up the house? Continue to seal, weatherstrip and caulk until you find that in quite cold weather, a light but not excessive fog or mist develops occasionally on windows on the downwind side. At this point you've achieved a considerable saving, without making the house too airtight. Most homes have a long way to go to reach this point.

Above all remember that oil and gas furnaces in closed furnace rooms need a free and unobstructed supply of air to keep the flame burning efficiently.

The draft gauge

When you're sitting around the house, does a member of the family occasionally complain of feeling a cold draft? This can be difficult to locate by feeling along the bottom of a window or around a door, but here's a simple item you can make to accurately pinpoint the source of the draft.

It's called a *draft gauge* and all you need is a metal clothes hanger, a plastic sandwich bag (or a piece of light tissue paper), a pair of scissors and two clothes pins.

Cut the sandwich bag down each side and wrap one end over the cross-bar of the clothes hanger. Use the clothes pins to fasten the bag to the bar.

To check for drafts around a window, hold the gauge steady by the handle of the hanger with the plastic bag close to the edge of the frame. If any breeze is coming in, the movement of the plastic will show you where to caulk the window frame. Use the gauge on all suspected areas. You'll be surprised to discover how many spots need caulking or weatherstripping.

WEATHERSTRIPPING

What type of weatherstripping should you use? Here's a simple guide to effectiveness, cost and application:

Type	Effectiveness	Relative Cost	Where Applied
Closed-cell vinyl foam (sticky back)	Excellent	Moderately expensive	Doors (top and sides) Windows (top and bottom)
Vinyl-covered polyurethane foam	Good	Moderate	Doors (mainly top and sides)
Combination kits (vinyl foam on wood strips, rolled vinyl on aluminum strips or vinyl flap on aluminum strips)	Excellent	Expensive	Doors (especially when warped)
Hair felt	Fair	Inexpensive	Doors (top and sides) Windows (top and bottom)

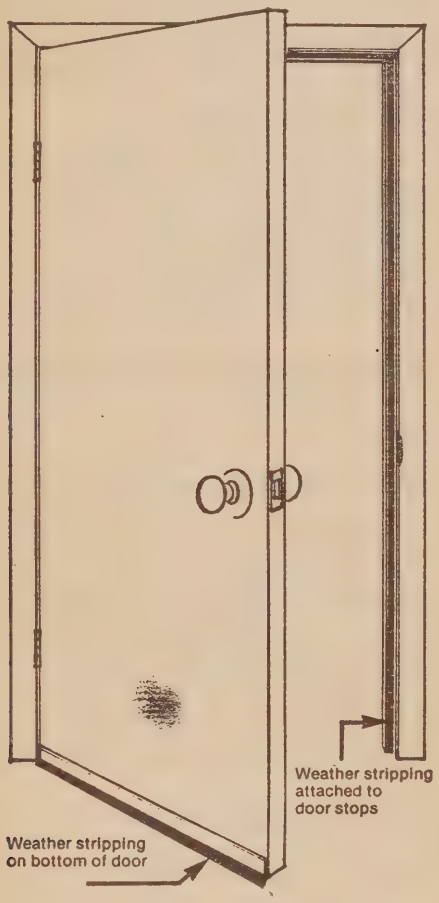
Doors

The outside doors of the house should fit snugly so that air can't sneak in around the edges. If they don't fit snugly, put weatherstripping around the door frames.

- *How to weatherstrip a door.* Close and lock the door so the door and casing are tight together. If you're using a rigid stripping, measure and cut the 3 or 4 pieces you need, mitering them to fit well at the top corners. If your weatherstripping is flexible, you may want to cut it in pieces for convenience or use one continuous piece for the sides and top.

Tack or screw the side and top pieces to the door stops with the contact edges pressed evenly, but not too tightly, against the face of the door.

The bottom stripping, depending on the type, is attached to either the bottom *inside* edge of the door or to the doorstep. Make sure it's a snug fit before you tack or screw it in place.



Windows

Leaky windows should be weatherstripped around the frames using appropriate stripping from the earlier chart. If the windows don't have to be opened they can be locked and caulked.

CAULKING

Caulk around the frames of doors and windows, and seal cracks under eaves, around flashing, between bricks and in basement walls.

- *How to do it.* You can buy a reasonably priced caulking gun and a tube of caulking compound at your local hardware or building supply store. There are different types of compound; pick the right kind and colour for what you want to do. The more expensive ones usually last much longer.

  Effective caulking takes practice so go slowly and follow the instructions on the tube. Have paper towelling or a rag handy to wipe off the excess. When you're finished, run another check with the draft gauge to be sure all cracks have been sealed.

IV. OTHER CHILLY PROBLEMS

COLD-ROOM

The modern split-level home often has a cold-room next to the basement area, usually a part of the foundation under a verandah.

- *Treat the interior wall* of the cold-room exactly as you would the same outside exposed surface. Insulate it! It's also a good idea to insulate the door to the cold-room. This will keep it cold for storing vegetables, but won't chill the rest of the basement as well.

OPENINGS THAT SHOULDN'T BE THERE

- *Seal air leaks* to the attic and crawl space by weatherstripping around doors, ceiling fans, electrical fixtures, plumbing, heating ducts and pulldown stairways.
- *Don't close off louvers* in the attic and crawl spaces because they're needed for ventilation to prevent moisture build-up.

- *The basement door* should be kept closed. The basement is normally one of the cooler areas in the house; keeping the door shut will prevent cool air from mixing with warmer air throughout the house.

MAIL AND MILK CHUTES

A poorly fitted mail or milk chute will let warm air sneak out and cold air creep in.

- *Inspect chutes* during your fall check of home heating and accessories.
- *Weatherstrip* where necessary around cracks and poorly fitted chutes.
- *Springs.* If the chute covers are on springs, make sure they close properly. A drop of oil can sometimes work wonders. If necessary, replace the spring. Keep a couple of spares on hand.

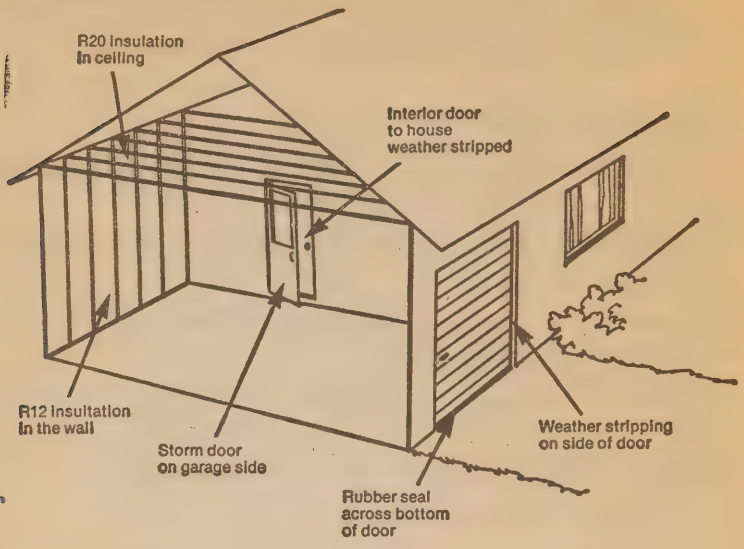
ATTACHED GARAGES

Take precautions to make sure that your attached or under-the-house garage isn't an escape route for warm air.

- *Check the following:*
  1. If you have a room over the garage, find out if the builder has added insulation to the garage ceiling.
  2. Inspect the walls for insulation, especially the ones adjoining the house.
  3. Does the garage door have a good seal, especially across the bottom?
  4. Is there a good fit on the door leading from the garage into the house? Use the draft gauge to check for drafts.

  If the answer to some or all of these points is "No", you have some work to do.
- *Insulation.* Without proper insulation, the garage walls and ceiling will steal heat from the house. Go

back to the earlier section that talks about adding insulation.



Insulation in attached garage

- *Garage door.* Keep the door tightly closed as much as possible. If the door has become warped so that you don't have a good seal on the top or sides, fix it with weatherstripping to seal the cracks.

  The seal across the bottom should be tight so that cold air and snow won't slip in. Check the seal in the fall and replace it if necessary. Make sure you know the thickness of the seal (usually made of rubber) before you go to the hardware or building supply store for a new one.
- *Door to the house.* If you have a door leading from an unheated garage to the house, it should be sealed with weatherstripping. Think about adding a storm door; it will add air circulation through the house in summer — minus insects of course.

For information on drapes, fireplace dampers and ventilation fans, see the last section of the previous chapter.

hot water heating

The most expensive item in your home energy budget is space heating. And running right behind it is *hot-water heating* — whether by oil, natural gas, propane or electricity. There are many ways to save energy without resorting to cold showers. Let's look at some of them.

HEATING THE WATER EFFICIENTLY

A good place to begin is with the heater itself.

- *Thermostat.* Be sure that your thermometer is not set too high. About 120°F (50°C) is ideal. The tank itself should have a recovery rate of at least 75 per cent. This means that if it holds 40 gallons, it will reheat 30 gallons per hour. Adequate for most families, and an economical use of the heater.
- *Service.* If your tank is heated with oil or gas, be sure it gets an annual or semi-annual check along with your furnace. The flame, barometric damper, and stack temperature should all be adjusted to ensure that the energy you're using is heating the water, not scooting up the chimney.
- *Drain tap.* Down near the bottom of your heater is a small tap. Drain a pail of water from here about once a month to clear out sediment and mineral deposits.

KEEPING IT HOT

- *Insulation* is a must to cut heat loss as hot water moves through the system. Most modern tanks are

insulated, but if you happen to have one that isn't, wrap some insulation batts or rolls around it. (See page 61 for a guide to insulation.) Be sure you use a fire-resistant type, and keep it well clear of the burner on an oil- or gas-fired tank.

- *Protect the pipes.* Hot water moves from the tank to the various outlets in the house through pipes that normally run along the basement ceiling — the coolest part of the house.

Again, the best way to prevent heat escaping is by using insulation.

A Saturday afternoon project: You need a stepladder, scissors, insulating strips (from your hardware or building supply store) and tape. Start at the hot-water tank and wrap strips around all the exposed pipe, making sure that junctions are well covered. You'll be saving energy and money for years!

DRIP, DRIP, DRIP, DRIP

One drip per second from a leaky hot-water faucet or shower-head sends about 175 gallons a month down the drain. That's cash down the drain!

Show your whole family what a little drip costs.

Use a leaky faucet or adjust a kitchen sink tap (cold water, please) to produce a steady drip, drip. You need an 8-ounce measuring cup, plus pencil, paper and a clock.

Catch 10 minutes worth of drips in the glass. Let's say it's 3 ounces. Here's how to figure out how much energy you're wasting with that one little drip.

(1) Multiply the number of ounces by 6 to give the number per hour and then by 24 to give the total per day.

3 ounces x 6 x 24 = 432 ounces per day.

(2) To find the number of gallons per year multiply by 365 days and divide by 160 ounces in a gallon.

432 ounces per day x 365 days ÷ 160 ounces = 985.5 gallons per year.

(3) To find the number of Btu used to heat the water you must first know the temperature of the tap water, before and after it is heated. Assume the tap water temperature when it enters the hot-water heater is 40°F, and 140°F after it is heated. The difference is the number of degrees for which energy is required to heat the water. To find the Btu required, multiply the number of gallons per year by 10 pounds (weight of a gallon) and by the 100F degrees difference.

985.5 gallons per year x 10 pounds x 100F degrees = 985,500 Btu.

(4) Once you know the Btu you can find out how many gallons of oil, cubic feet of gas or kilowatt hours of electricity it took to heat the wasted water. Divide the following set of figures that apply to your heating into your answer (3):

One gallon of heating oil ..... 138,800 Btu
One cubic foot natural gas ..... 1,031 Btu
One kilowatt hour ..... 3,413 Btu

985,500 Btu ÷ 138,800 = 7.1 gallons of oil.
985,500 Btu ÷ 1,031 = 955.9 cubic feet of gas.
985,500 Btu ÷ 3,413 = 288.7 kilowatt hours.

(5) How much is this actually costing you? Multiply your figures in (4) by what you are paying for your method of heating. For example, if you are paying 2 cents per kilowatt hour for electricity, the cost in the example would be $5.77 a year.

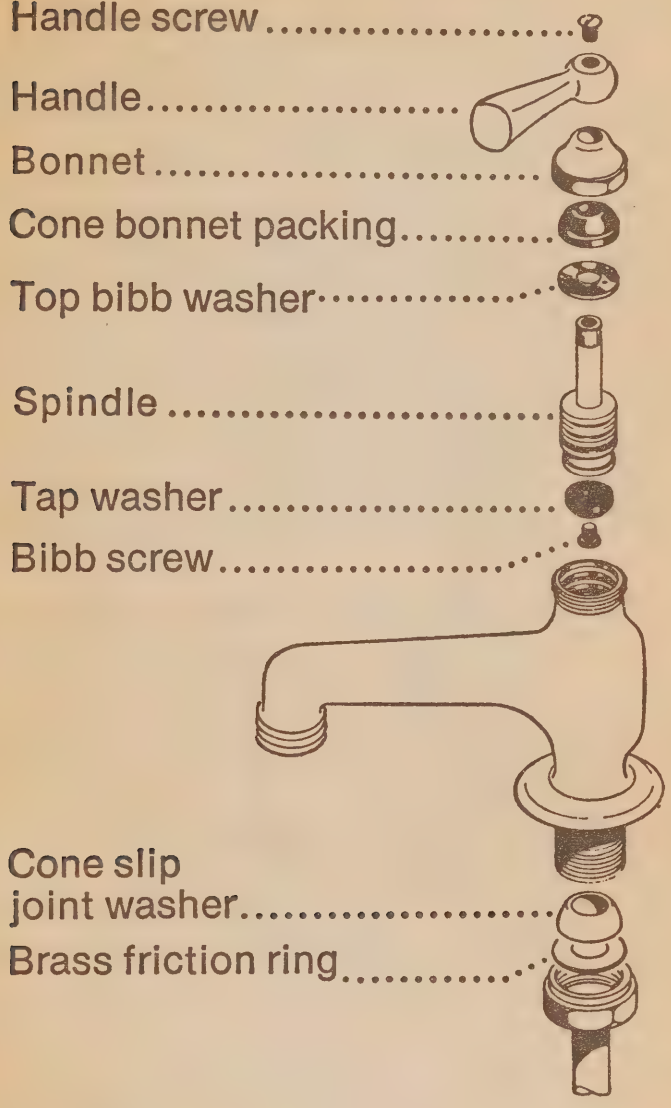
Now that you have figured out how much energy that dripping tap is wasting, how about taking a few minutes to fix the tap? Just follow these instructions, step by step, and you should be able to fix it in a few minutes.

How to fix a leaky faucet

The compression tap is the most common type found in Canadian homes. The flow of water is regulated by turning a handle which is attached to a threaded spindle. When the spindle is turned down, the washer or disc attached to the bottom of the spindle is pressed tightly against a smoothly finished ring or ground seal, to shut off the flow of water. If this doesn't make a good contact, usually because of a worn-out washer, water will leak through.

You'll need a wrench, screwdriver, fiber or composition-type washers and adhesive tape. The washers should be a good grade; start with ⅜", ½" and ⅝" sizes.

CUT-AWAY OF WATER TAP



(1) Turn off the water directly below the tap or, if there isn't a shutoff valve, turn off the main water supply.
(2) Drain all taps that are higher in level in the house than the one that you are going to work on. Otherwise the water will back up when you take the tap apart.
(3) Wrap adhesive tape around the bonnet to prevent it being marked by the wrench.
(4) Take off the handle by removing the screw that holds it to the top of the spindle. There may be a knurled nut or snap-on button over the screw-head that you will have to remove first. Remove the bonnet by turning counter-clockwise with a wrench.
(5) Slip the spindle out of the bonnet and remove the washer by taking out the screw that holds it in place.
(6) Replace it with a washer of identical size. If the washer is chewed up you will have to check the bottom of the inside of the tap for any damage.
(7) Wipe the inside of the tap to remove any metal chips.
(8) Put the bonnet over the spindle and check the packing on the outside. If it's worn, replace it with impregnated cord that you can buy at your local hardware. Wind the cord clockwise from bottom to top.
(9) Re-set the bonnet and spindle but don't tighten the spindle in the seat.
(10) Tighten the bonnet by turning clockwise until it is secure.
(11) Replace the handle, turn on the water and you have just finished fixing your first tap.

HOW ABOUT USING LESS HOT WATER

One water-saving suggestion you've probably already heard is to take a bath with a friend. Here are some other ideas to cut down on hot-water consumption.

- *Switch from sit-downs to stand-ups.* Take showers instead of baths. If somebody questions the saving, here's an experiment to prove the point:

All you need is a bathtub and a yardstick. The next time you're taking a bath, measure the depth of the water before you climb in.

The following time take a shower, but close the bathtub drain so the water can't escape. Enjoy a leisurely shower, but before you pull the plug, measure the depth of the water with your trusty yardstick. You should find that the shower used substantially less water.

- *Install a "water-saver"* on your shower-head. During the course of your shower, when you don't need so much water, turn the nozzle towards the wall. This reduces the flow of water. When you want a full flow again, just turn the nozzle back to centre. Check with your local building supply store. If you're moving into a new house, ask the contractor to install one.
- *If you must sit, use cooler water and less of it.* The cost of a bath is determined mainly by the energy used to heat the water. The water itself is very cheap. The amount of energy used will depend on the amount of water and the temperature. The table assumes you have a standard bath. The volume is related to the depth of the water (before you get in). It's also assumed that the water is heated by electricity at a cost of 2 cents per kilowatt hour (kWh).

How much do you pay for a bath?

Depth of Water		Temperature of Water		
Inches	Centimetres	Warm — 112°F 50°C	Hot — 140°F 60°C	Very hot — 158°F 70°C
		cents	cents	cents
4	10	6	8	10
5	13	8	11	13
6	15	10	13	15
7	18	12	15	18
8	20	13	17	20
9	23	15	19	23
10	25	17	21	25

- *When you're doing the dishes,* fill a pan (or the other half of a double sink) with rinse water instead of letting the water run.

- *When you're shaving,* partially fill the basin with hot water instead of letting it go down the drain. You'll shave dollars from your heating and water bill. To save even more, switch to an *electric razor.* The electricity cost will be lower than the hot-water cost.

- *When you need boiling water,* start with water from the hot-water tap. It will take less time to bring to a boil.

- *Use your hot water twice.* After you've had a bath or done the dishes in the winter, don't drain the hot water right away. Let it sit for a while and heat the room; then pull the plug. It's better to heat the house than the sewers.

Caution:

All gas-fired hot-water heaters should carry instructions on lighting the pilot light. These are usually printed on a label, plate or decal near the controls. If the pilot light does go out, there may not be anything wrong; it may have been blown out by a draft or an accumulation of dust and dirt. Follow the instructions carefully and relight the pilot yourself. If you encounter difficulties, turn off the controls and call your serviceman or gas utility.

Did you know that . . .

- A good insulating jacket can reduce heat loss through the walls of a hot-water tank by 80 per cent.

- 10-foot rather than 30-foot pipes can save you enough hot water in one month, for ten showers.
- The simple fact of insulating a 10-foot length of your hot-water pipes can save you enough hot water every month to do three full-cycle loads in a dishwasher.
- No matter which water-heating system you use, a dripping tap means a waste of energy and money.

savings in the kitchen

One of the biggest energy-using rooms in your home is the kitchen. It's a good place to look for ways to save.

There are many, many appliances on the market, all promising to make kitchen work lighter. However, before you buy a new item or replace one that's worn out, ask yourself three simple questions:

1. *Do I really need this new item?* How often will it be used? Do my friends or neighbours have one? Can I do the job manually or with an appliance I already own? Is there an alternative that won't consume energy?

2. *Can I avoid those energy-draining frills?* There's no doubt that I need the basic refrigerator and stove. But do I really need a butter warmer, an ice-cube dispenser, or a rotisserie?

3. *What will the appliance cost me in energy and cash to operate?* What's the power requirement over a year? Is there a more efficient unit with a lower operating cost?

At a time when energy consumption is important and many people are questioning the value of gadgets, take a thoughtful moment to honestly assess your needs. Will a host of appliances *really* liberate you from kitchen work?

These are all questions of personal choice and only you can answer them. The table below should help you make your decisions.

HOUSEHOLD APPLIANCES

Estimated average annual consumption and operating cost — based on an average of 2.35¢/Kilowatt hour (kWh).

Appliance	Estimated annual consumption (kWh)	Estimated annual energy cost
Air conditioner (6,000 Btu)	500	$11.75
Car block heater	456	10.71
Clock	18	.42
Clothes dryer	900	21.15
Coffee maker	100	2.35
Dehumidifier	400	9.40
Dishwasher (not including hot water)	300	7.05
Electric blanket	125	2.93
Electric kettle	150	3.52
Electric shaver	1	
Electric stove	1,200	28.20
Electric water heater	4,000	94.00
Food waste disposer	25	.59
Fryer (deep fat)	70	1.65
Frying pan	180	4.23
Grill (sandwich)	30	.71
Fan (furnace)	800	18.80
Hair dryer	15	.35
Humidifier	200	4.70
Iron	120	2.82
Kitchen fan	50	1.18
Mixmaster	15	.35
Radio (tube type)	100	2.35
(solid state)	10	.24
Refrigerator (12 cubic feet)	850	19.98

Appliance	Estimated annual consumption (kWh)	Estimated annual energy cost
Refrigerator (frost-free — 12 cubic feet) ...	1,200	28.20
Freezer (14 cubic feet)	1,200	28.20
Freezer (frost-free — 14 cubic feet)	1,600	37.60
Sewing machine	10	.24
Television (black & white — tube)	400	9.40
Television (black & white — solid state)	350	8.23
Television (colour — solid state)	450	10.58
Toaster (pop-up)	40	.94
Vacuum cleaner	40	.94
Washing machine (not including hot water) ..	50	1.18
Washing machine — automatic (not including hot water)	90	2.12

YOUR STOVE

The biggest user of energy in the kitchen is usually the stove — electric or gas. You can economize and still turn out delicious meals.

The oven

Using the oven rather than several elements saves energy because once the oven reaches the required heat it shuts off and cooks with stored heat. Elements, on the other hand, are always on.

- *Plan meals.* With a little forethought, meals can be planned to save energy. How about a total oven meal: casserole, baked potatoes and baked apple dessert. If you have several items that usually cook at different temperatures, select the average temperature and remove each as it's done.

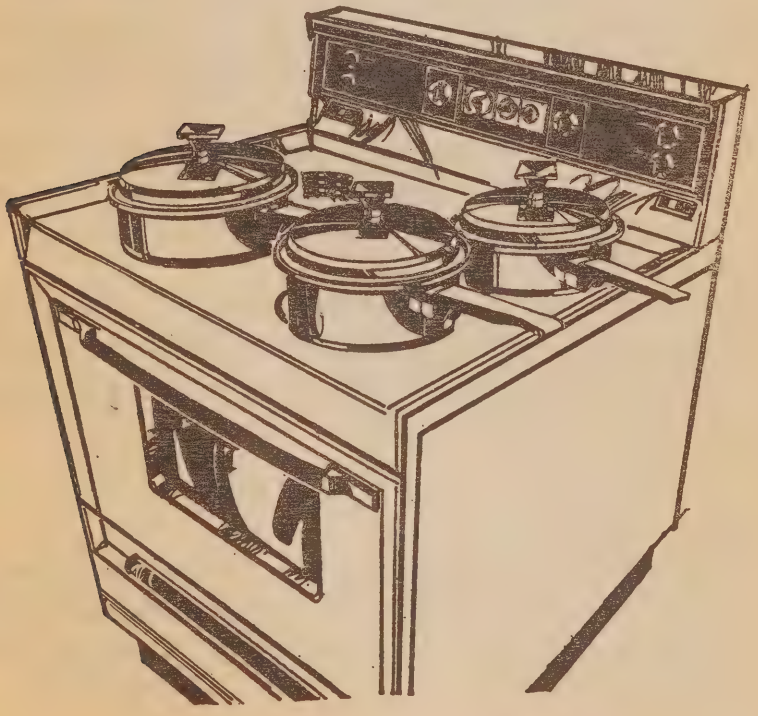
- *Multiple meals.* Cook a larger-than-needed quantity of one meal. Freeze a portion of it for another day (as soon as it has cooled to room temperature). You'll save energy and money.
- *Keep the door closed.* The more quickly you can put an item into a hot oven the less heat will be lost. Did you know that each time you open the door you lose about 20 per cent of the heat that's inside? Don't peek!
- *Don't use the oven for small jobs.* If you're toasting or broiling, use a smaller appliance such as a toaster or fry pan. Remember that toasting bread in the oven takes three times more energy than in a pop-up toaster.
- *Don't pre-heat unless necessary.* Usually pre-heating is a waste of energy — except for cakes and pastries. Items that will be cooking for more than an hour do *not* need a pre-heated oven. And setting the oven temperature higher than required won't make the oven heat up more quickly.
- *Use glass baking dishes.* Glass or glass ceramic baking dishes transfer heat more efficiently than metal and let you set the temperature about 25 Fahrenheit degrees (14 Celsius degrees) lower.
- *Thaw frozen foods.* Most frozen foods, especially meat, should be thawed before cooking. (Do it in the refrigerator to avoid bacteria build-up.) Cooking frozen food takes longer and uses more energy. Take meat out of the refrigerator about an hour before cooking time to warm up, but be sure to keep it covered.
- *Turn down heat near the end.* If you're cooking a roast you can save energy by turning off the heat about 30 minutes before it's finished. The remaining heat should be enough to finish the job.

- *Check oven temperature.* At least once a year and preferably more often, check the temperature of your oven with a thermometer. You'll make sure that the dial is accurate and that you're not wasting energy.
- *Warming with stored heat.* You can easily warm some items — buns or plates — with retained oven heat, after the main meal is cooked. Now, do you really need an electric bun warmer?
- *Don't use oven for supplemental heat.* The oven is an expensive and inefficient way to warm the kitchen. If you need more heat, a small space heater makes more sense.

Elements

Here are some ways to save on the top of the stove.

- *Pots and pans.* Buy pots and pans that are bright and shiny, with straight sides and flat bottoms and



tightly fitting lids. Your food will cook more quickly, more evenly and more economically.

- *Does the pot fit?* The bottom of the saucepan should cover the element entirely but not extend more than one inch beyond the outer ring of the element.
- *Don't drown the beans.* When you're cooking any vegetable, use only a small amount of water. You don't even have to cover all the vegetables with water; the steam will cook them. You'll save energy, vitamins and flavour.
- *Use minimum heat.* Once the water is boiling, turn the dial to the lowest heat that will keep it boiling. A higher setting only creates more steam and doesn't speed up the cooking.
- *Double boiler.* Use a double boiler for vegetables, sauces and heating cold food. One element instead of two!
- *A pressure cooker* is a good fuel-saver. Use it for stews, soups, pot roasts and almost all your vegetables.
- *A vegetable steamer* is another good idea. This small, collapsible metal basket folds or expands to fit most saucepans. Very little water — or energy — is needed to steam food.
- *Turn off heat.* Another way to save is to turn off electric burners 2 or 3 minutes before the end of the proper cooking time. The elements will stay hot and food will continue to cook.

The gas stove

Many families have gas stoves, especially in western Canada. Most of the points above apply to both electric and gas stoves, but here are two special points for the gas people.

- *Flame efficiency.* A clear, blue flame is a sign of top efficiency. If the flame is yellow, or has yellow streaks in it, something is probably clogging the outlets. Turn off the gas, remove the burner and clean the parts with a wire pipe-cleaner. If this doesn't improve the flame, call your serviceman.
- *Flame height.* When you have pots or pans on the burner elements, the flame should be just touching the bottom. It's a waste of gas to send the flame licking up the sides.

REFRIGERATORS AND FREEZERS

Buying

Refrigerators are now an accepted part of Canadian life, and freezers are steadily growing in popularity. They are both large consumers of energy, so it really pays to shop around when you're buying a new model.

- *Frost-free feature.* The first shopping decision you'll have to make is between a standard and a "frost-free" model. If you take the frost-free unit, you'll pay more when you buy it and up to 50 per cent more for the electrical energy to run it. *Example:* A standard 12 cubic-foot model that consumes 850 kilowatts a year adds about $20 to your electrical bill. A similar frost-free model could use about 1,200 kilowatts and cost $28. The same holds true for freezers, with the frost-free model using a good deal more energy.
- *Adequate insulation.* Before you buy any model, check the quality of insulation. In a cheaper unit that is poorly built, the compressor will run more often and consume more energy to keep the cold level you want. This will tend to reduce the life of the motor so that within a few years you'll either have

to replace the motor or the entire unit. Your initial saving on a cheaper model can be swallowed up in higher energy costs and shorter life.

- *Frills.* Ask yourself if you really need a butter warmer, crushed-ice dispenser and other such frills. They all consume extra energy.

ENERGUIDE

The Department of Consumer and Corporate Affairs is developing an energy labelling program for consumers. In 1978, ENERGUIDE labels will begin to appear on all household refrigerators, stoves, clothes washers, dryers, freezers, dishwashers and room air conditioners.

The labels will allow you to compare the monthly energy consumptions of products before you make your purchase decision. Watch for them.

Location

Where your refrigerator or freezer is located has a lot to do with how well it performs.

- *Avoid heat sources.* Keep both these major appliances away from the kitchen stove, direct sunlight and heat vents.
- *Ventilation.* Leave enough space around the unit so you have a good circulation of air. If there isn't enough space, the heat generated can't escape and this puts a strain on the cooling system.

Maintenance

- *Vacuum coils.* Condenser coils on the refrigerator should be kept clean. Dirt acts as an insulator and

makes the compressor work longer to keep the proper temperature. Use a vacuum cleaner to pull out dirt. (Condenser coils are usually on the back, occasionally on the bottom.)

- *Door fit.* The door should be airtight so cold air can't escape. Otherwise, both the compressor and your furnace have to work harder to correct *two* problems.

  Check the seal by closing the door on a piece of paper. If you can pull it out easily the rubber gasket should be replaced. Read your owner's manual to see if you can fix it yourself; if not call a serviceman.
- *Defrosting.* The frost build-up in a refrigerator or freezer should not exceed ¼ inch. Ice reduces the cooling power by acting as unwanted insulation. Defrost regularly.

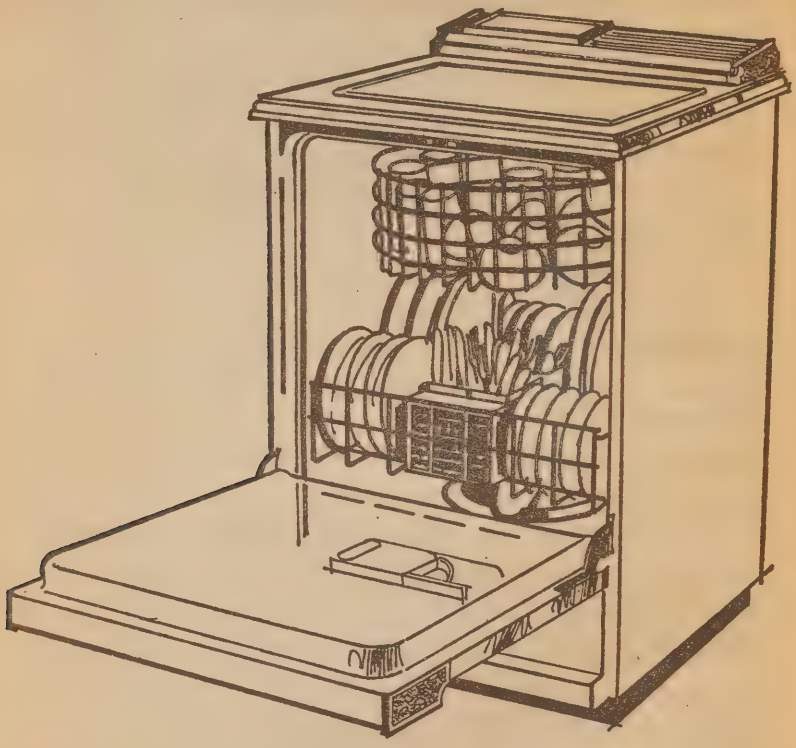
Operation

- *Setting.* Don't set the temperature any colder than you need.
- *Keep the door closed.* If you tell your children a little more about energy conservation, it may help them understand why you keep nagging them to shut the refrigerator door. Especially important in summer.
- *Don't overcrowd.* The refrigerator works best when it isn't overcrowded. There must be room for air circulation inside — otherwise the compressor will work too hard to keep the right temperature.
- *Cool down hot foods.* Save energy by allowing hot foods to cool before putting them away.
- *Turn off when you're away.* Before you go on vacation, clean out the refrigerator, wipe it and turn it off. It's also a good idea to leave the door ajar; if the light stays on, unscrew it.

DISHWASHERS

The dishwasher has become a popular item in the kitchen — especially with teenagers who can escape clean-up duty.

Instead of elbow grease it uses electrical energy and a good deal more hot water. The energy consumed by the washer itself (not including hot water) amounts to about 300 kilowatt hours per year depending on how it's used.



Here are some ways to economize:

- *Wash only full loads.* Your dishwasher is most economical at full capacity. Don't use it for a few plates and forks. Save them up (rinse if necessary) and do a full load at the end of the day.

- *Correct loading.* Follow your manufacturer's recommendations for loading and use of detergent. It will run more efficiently and your dishes will be cleaner.
- *Scrape dirty dishes.* Pre-scraped dishes can be washed on a shorter cycle. And you don't have to worry about food particles hurting the machine's performance.
- *Let dishes air dry.* The dishwasher has a heater element to dry the dishes after the wash is completed. Stop the cycle before the element comes on and open the door. The hot dishes will dry themselves and you'll save some electricity.
- *Don't warm plates in dishwasher.* Some people use the heater element of the dishwasher to warm dinner plates for serving. Use the oven's heat instead.

SMALL KITCHEN APPLIANCES

Most modern kitchens have an assortment of small appliances, as well as the standard stove and refrigerator. Sometimes they make contributions to energy conservation. Often they fall into a wasteful category of *electrical gadgets.*

- *Use small, efficient appliances.* Fry pans, toasters and kettles are more efficient than the stove for small jobs. *Example:* the pop-up toaster is three times more efficient for toasting bread than the oven grill.

Kettles

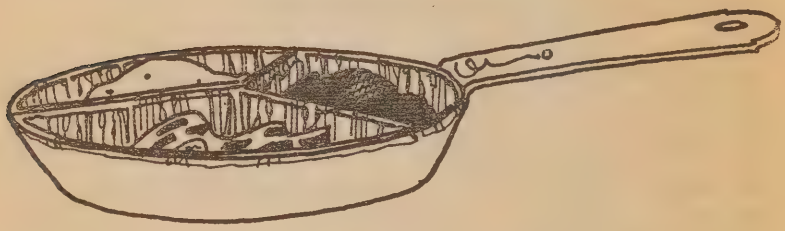
- *Clean out scale.* Hard-water deposits inside a kettle can reduce heat transfer. Clean them out periodically.
- *Boil only as much as you need.* Don't boil a full kettle for one cup of coffee.

Toasters

- *Clean out crumbs.* Clean out the crumbs and burnt-on deposits. You'll get better performance.
- *Check filaments.* Have a look at the heating filaments from time to time to be sure they're not broken. (Unplug the toaster first!)
- *Not too dark.* If you're willing to eat light and medium-brown toast, you'll save a little energy.

Frying pans

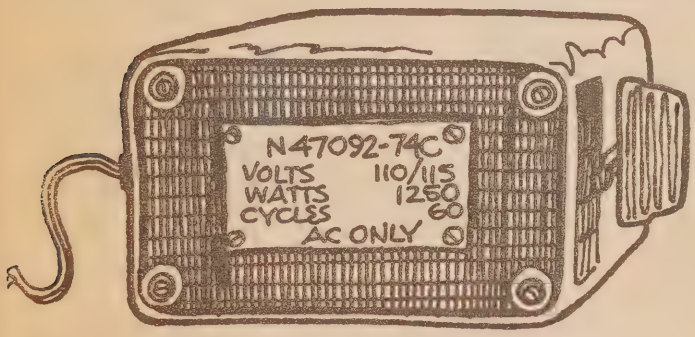
- *Check temperature.* Check the accuracy of your temperature control. Set it for 212°F (100°C) and see if water boils. If it's cooler than the setting, have a repairman look at it.
- *Multi-use.* You can use small aluminum-foil dividers to cook several foods at one time.



savings when using appliances

CHOOSING APPLIANCES

- *How much energy?*
  Before you buy any new appliance it's wise to find out just how much energy it will use. Take a moment to look at the plate on the bottom or side of the appliance which gives the electrical "ratings." Ignore all numbers except the wattage rating. It looks like this:



The table p.108 shows how much energy (measured in kilowatt hours) is consumed in *one hour* of operation. The two columns to the right show the weight of oil or coal burned at the power station to produce this amount of electrical energy.

Example: If you have an electric frying pan, rated at 1,500 watts, which you use for 4 hours a week, it consumes 6 kilowatt hours of electricity. This might cost you 14 cents on your bill. The generating station, in turn, would burn 60 ounces of oil or 80 ounces

of coal to provide you with this electricity. Multiply these figures by 1,000 homes in your area and the total jumps to about 3,750 pounds (375 gallons) of oil or 2½ tons of coal. And this is just for one appliance!

ELECTRICAL APPLIANCE ENERGY TABLE

Appliance wattage rating	*Kilowatt hours of energy used per hour*	*Ounces of oil burned per hour*	*Ounces of coal burned per hour*
10	1/100	1/10	13/100
25	1/40	1/4	33/100 or (1/3)
40	1/25	2/5	1/2
60	3/50	3/5	4/5
100	1/10	1	1-1/3
150	3/20	1-1/2	2
200	1/5	2	2-2/3
300	3/10	3	4
500	1/2	5	6-2/3
750	3/4	7-1/2	10
1,000	1	10	13-1/3
1,500	1-1/2	15	20
2,000	2	20	26-2/3
5,000	5	50	66-2/3

- *Manufacturer's instructions.* Every new appliance arrives with a manufacturer's manual to help you get the best performance. It shows you how to get the maximum efficiency from the appliance for the least amount of electrical energy. Read it well!
- *Savings tips.* Read the chapter, *Savings in the Kitchen.* It shows how to make the best use of many small appliances, as well as the stove, refrigerator and freezer.

WASHING MACHINE

- *Full loads.* Your washer – automatic or manual – should be used only when you have a full load.
- *Overloads.* Overloading reduces the cleaning action of a washer, resulting in more abrasions, more lint, and more wrinkles. In fact, too large a load can waste current by forcing you to do some items over again.
- *Save hot water.* The biggest cost item in washing clothes is the hot water. The more you can do with cold and warm wash cycles, the more energy you save.

Permanent-press items need only warm water. Cool or cold water is fine for washable woolens. Lightly soiled items can often be cleaned without hot water.

- *Water level selector.* If your automatic washer has a water level selector, choose the correct setting for the size of the load.
- *Cold water wash.* Many people now use nothing but cold water washes and find their clothes come out just as clean.

ELECTRIC CLOTHES DRYER

- *Venting.* It's a mistake to think that a dryer doesn't need to be vented to the outside in the summer. Venting gets rid of moisture-laden air and speeds up the drying time.

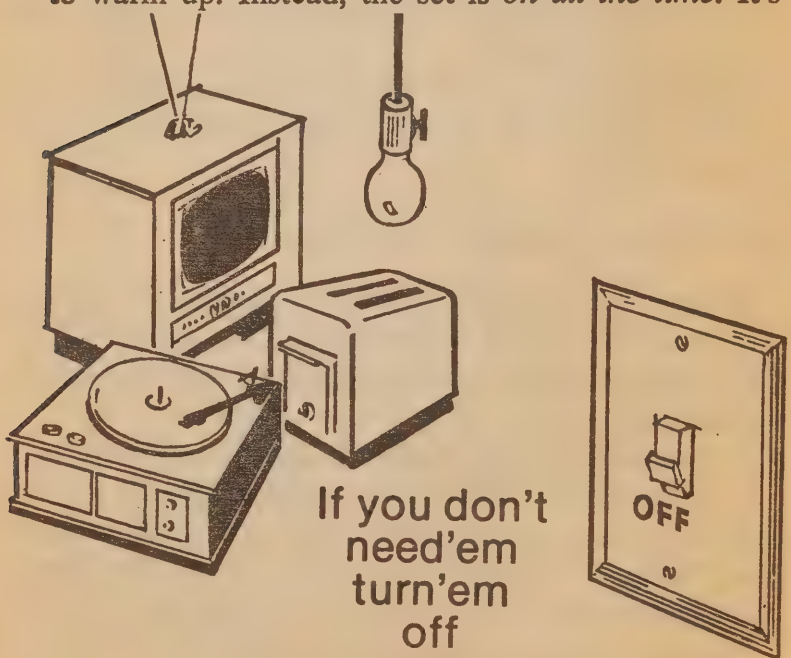
  In winter, you may want to vent into the basement to add moisture to the air. Put a nylon stocking over the vent to catch the lint. You can add further moisture to your house by drying clothes inside in winter.

  Remember never to vent your dryer through the chimney or to vent a gas dryer inside.

- *Lint filter.* To reduce your drying time, clean the lint filter after each load. At least once a year clean the outside of the dryer drum and the motor to get rid of lint build-up. (You can usually do this by taking out a few screws and removing a back or side panel.) Don't forget to clean the exhaust pipes as well.
- *Short cycles.* Use the shortest possible cycle so you won't overdry clothes. It's a good idea to remove clothes slightly damp for ironing. With a little practice you'll be able to remove ready-to-wear clothing wrinkle-free.
- *Full loads.* Always dry a full load at one time, but don't overload.

TELEVISION

- *Instant on.* Some people own an instant-on television set because they can't wait a few seconds for the set to warm up. Instead, the set is *on all the time.* It's



kept "warm" and draws electricity 24 hours a day. It may be the ultimate in convenience — but is it worth it?

If you have an instant-on set and go away for the weekend, be sure to flick the "holiday switch" or unplug the set. It won't hurt the set and will save you a little money.

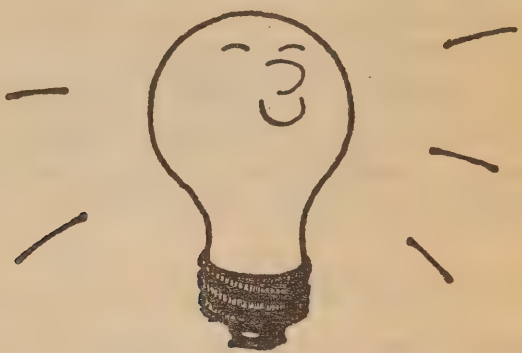
- *Turn it off.* When your program is over – on any kind of set – be sure to turn it off. A television set takes a good deal of power. If nobody is watching, you're just wasting electricity and perhaps speeding up the arrival of a repair bill.

VACUUM CLEANER

- *Empty the bag.* A vacuum cleaner is one of the handiest items in the home. But it won't work well unless you empty or replace the dust bag frequently.
- *Listen to the motor.* If there's a change in the sound of your machine, or if the motor housing becomes hot, something may be blocking the hose or brush. Stop and find the problem.

electric lighting

"There's lots of electricity around. Surely this is one kind of energy that I don't have to worry about saving."



This is an all too common view. Turning out lights that aren't in use is definitely an important energy saving. You save electricity and in many cases you also save the coal, oil or natural gas used at the generating station. Even hydro sites are now limited. Developing future nuclear and hydro facilities will be very expensive.

So, yes, turn out those lights.

TYPES OF LIGHTING

Incandescent

This is the familiar light bulb found in most homes. Light is produced by heating a tiny filament until it glows. Unfortunately it produces much more heat than light — about 90 per cent heat and 10 per cent light. This heat is usually wasted because it's generated at the wrong time or in the wrong place.

It's easy to be confused by all the different incandescent lamps on the market — *general service, eye*

saving, shadow ban, extended service. Here is a chart that gives you the advantages and disadvantages of each.

The most energy-efficient is the general service which gives the most light (measured in "lumens") for the watts consumed.

TYPES OF INCANDESCENT LAMPS AVAILABLE

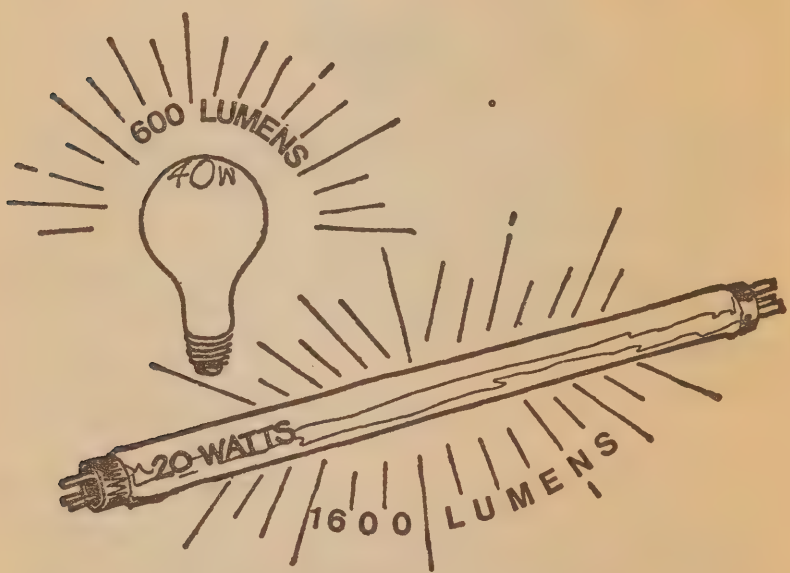
Type	Advantages	Disadvantages
General service	Most economical	Requires shade to avoid glare
	Average length of life	
	Produces relatively high proportion of lumens per watt	
Eye saving and *Shadow ban*	No glare from lamp	More expensive than general service lamp
	Produces equivalent amount of lumens as general service lamp	
Long service (extended service)	Longer length of life	Reduced lumens per watt
		More expensive than general service or eye saver
		Inefficient energy user
Krypton-filled	Same lumens or more compared with general service	Costs approximately three times as much as general service
	Long life	Requires heavier shade than normal because of glare
	Good for outside locations that require extra lumens per watt	Not readily available

Strange as it may seem, one lamp of higher wattage will give more light than the same wattage from two smaller lamps. *Example:* one 100-watt lamp will give more light than two 60-watt lamps (1740 vs. 1720 lumens).

Fluorescent

Most fluorescent lights are found in offices and schools, however they can bring important energy-savings to the home as well.

Fluorescent lighting is over 5 times as efficient as incandescent lighting, on a lumens per watt basis.



Fluorescent lighting can also be confusing. There are many types on the market: *"cool white"* and *"daylight"* are the most popular. *Cool white* produces the most lumens, while *daylight* is a softer light. *Cool white* also produces more glare unless shaded.

Fluorescent lights are best used in work areas and in bathrooms, kitchens and recreation rooms.

LET THERE BE LIGHT, BUT NOT TOO MUCH

- *Turn off some lights.* Whenever you leave a room be sure to turn off the lights behind you, even if it's only for a short time.

> *Forget the "Surge"*
>
> There's a general misconception that leaving lights on saves more electricity than turning them off and then on again. Not true! There's a momentary surge of power when a light is turned on, but it's equal to only a second or two of lighting time.

- *Try lower-wattage bulbs.* How much light do you really need? Try putting lower wattage bulbs in hallways, basements, bedrooms and wherever close work is not done.
- *Use localized lighting for close work.* For reading, sewing, cooking, games or hobbies, use good localized lighting from lamps or specially installed fixtures.

- *Try fluorescent bulbs.* When you're renovating or installing new lighting, try fluorescent fixtures. They're much more efficient.
- *Keep bulbs and fixtures clean.* A barely visible accumulation of dust will lower the lighting level. And may cause you to turn on more lights. Dust lamps regularly.
- *Try a dimmer switch.* Think about a dimmer for the dining room. You'll be able to turn the lights down low for a romantic touch, especially if you have candles on the table.
- *Use proper lampshades.* The ideal shade is white or near-white and conceals the lamp bulb, both when you are standing and sitting. The shade should be dense enough to keep the bulb from glaring through (but not opaque) and should reflect the light. The light should be sent upwards as well as downwards, with the shade wide enough at the bottom to spread light over a fairly wide area.
- *Paint with light colours.* Light paint finishes on both ceilings and walls will reflect the light and perhaps reduce the number of lamps you need.
- *Out-of-the-way places.* Use a long-life or extended service lamp in those awkward hallways and cupboards where it's tough to replace a bulb. This type will cost a little more (see earlier chart). Keep in mind that a long-life lamp produces lower lumens than an equivalent wattage general service type.
- *Reflections.* Be sure that lighting equipment does not reflect on shiny surfaces — the television screen or a pile of glossy magazines. The glare will tire your eyes.
- *Outside lighting.* Do you really need a 100-watt lamp in the light standard at the end of the driveway?

Wouldn't a 60-watt or maybe a 40-watt do just as well?

Are floodlights necessary in front or back? Can you reduce the quantity or size? Think about an automatic timer to control the time when they are actually in use.

- *Christmas lights.* Christmas lighting has become a tradition in Canada, but that doesn't mean we can run wild. Keep your lights to a modest display, unless of course your electrical utility recommends a total ban. Don't put them up too far ahead of Christmas and take them down as soon as the holiday season is over.

  Try not to turn them on until after 7 p.m., so you won't add to the peak evening load, and turn them off before going to bed.

  In most cases, outdoor Christmas lighting can replace your normal outdoor lighting. Don't use both at the same time.

TEST YOUR LIGHTING SAVINGS

Now that you've been enlightened, let's see how much energy you can save. Here's how to do it:

For one day leave extra lights on; let the TV and radio play away. The next day be conservation minded; turn off everything you can find.

On the first day, read the electric meter early in the morning and make a note of the reading. (If you don't know how to read your meter, see the box below.)

The next morning read the meter again at the same time, and calculate how many kilowatt hours were used. Read it again on the morning of the third day. Take the difference between the two days and multiply by 365 to find out the number of kilowatt hours you could save in a year.

How much is this in cash? Check your last electric bill. It should show how much you pay per kilowatt hour. Why not encourage your children to carry out this project by themselves. Good conservation training.

How to read your electric meter

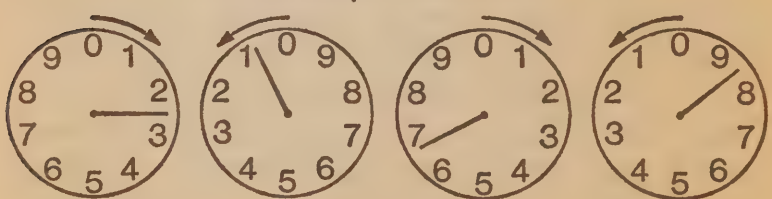
The electric meter is normally on the outside wall of the house or possibly in the basement. If you live in an apartment and have your own meter, it's probably in the basement. (If you can't locate it, ask the superintendent.)

The dials are normally organized from left to right. Some of these turn counter-clockwise. When the pointer is between two numbers, read the lower number.

Your meter probably has four dials. The right one gives the reading in tens of kilowatt hours, the next one in hundreds of kilowatt hours, and so on.

Below is an example of the meter dials. Look at them carefully and notice how the reading is made. The arrow indicates whether the dial is clockwise or counter-clockwise.

(Multiply by 10)



READING = 20680

(20685 is also correct)

summer cooling

Generally we Canadians enjoy a moderate summer and don't require a great deal of mechanical cooling in our homes. There are, however, those inevitable mid-summer heat waves that make us all wilt. For some people the solution is to go out and spend $200 or so on an air conditioner (plus the money to install it and to pay for the power it consumes) just for those few hot weeks per year. But before we do that we should ask ourselves: *"Do we Canadians really need air conditioning in our homes?"*

Given our summer climate, is air conditioning really necessary? These days many new houses and apartments come complete with central air conditioning. Again the question arises, "Is this really necessary in Canada?"

HOW TO KEEP YOUR COOL

First let's look at some of the ways to keep cool *without* resorting to air conditioners.

PLAY IT COOL YOURSELF

- Wear light clothing. Your body perspires to keep cool — so help it out.
- Slow down and relax; enjoy summer. Winter will be back all too soon.
- Don't do housework in mid-day. Save it for the cooler morning or evening.
- Have a mid-day nap — The siesta solution! At night try sleeping in your coolest room — perhaps the basement recreation room.

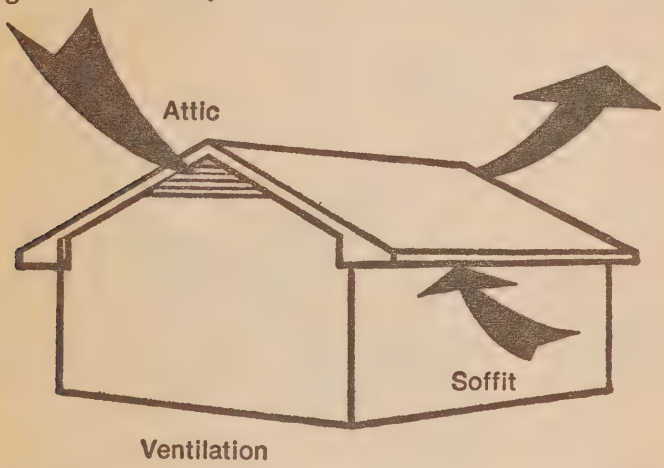
- Keep cold drinks on hand (returnable pop bottles please).
- Don't do a lot of cooking. Turn to salads and cold cuts. They'll go down more easily.
- Find a shady spot in the backyard or on the balcony. Relax with a tall cool one.
- Have a shower or a swim. You'll feel great. Even a child's wading pool or back-yard hose is refreshing. While you're at it, shower the house down. That cools it, just the way perspiring does for us.

KEEP THE HEAT OUT

- Ventilate your attic. Try an attic fan. One of the greatest sources of heat into the home is hot air trapped in the attic. The sun beating down all day on a dark roof heats up the attic air to 130°F (54°C)

or more. This in turn heats up the house, especially upstairs bedrooms. Even if you have good ceiling insulation this is still a major source of heat, and although attics are ventilated, this seldom gets rid of the hot air. An attic fan, however, can force it out and bring in cooler outside air.

Generally an attic fan is cheaper than an air conditioner and uses less power. It can be manually operated or governed by a thermostat to turn it on when the attic temperature reaches 100-110°F (about 40-45°C). See a local building contractor or electrician about installing one — and be sure it's placed *high* on the roof.



- Insulation helps. Just as insulation and weatherstripping keep valuable heat in during the winter, they also keep unwanted heat out during the summer. A double pay-off!
- Keep doors and windows closed during the hot part of the day if it's cooler inside. You might even leave storm windows on during the summer as long as they can be opened at night.
- If humidity is the problem, try a dehumidifier during the times when the house is closed.

KEEP THE SUN OUT

-Sunshine is great in the winter but only adds unwanted heat in the summer.

- Keep your drapes closed during the day. Open at night. (Just the opposite of winter.) Light coloured drapes and blinds reflect the sun's rays and reduce solar heat by as much as 50 per cent.
- Try awnings, sun screens, etc. They can reduce heat gain through windows by as much as 80 per cent.
- Plant some trees. Deciduous trees are best close to the house; they produce good shade for both you and the house during the summer, but let in valuable winter sunshine.

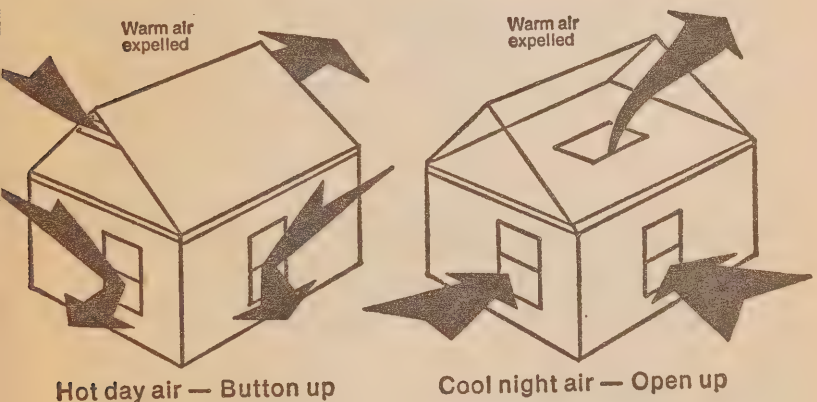
BRING IN COOLER AIR

Whenever the outside temperature is lower than inside, usually after sundown, use it for cooling.

- Open up those windows; let in the cool night breezes.
- Use a window fan or your attic fan (by opening the hatch to the attic) to draw air through the house.

If you have to stay indoors during the hours of the day when inside and outside temperatures are almost equal, VENTILATION can help you feel better. Moving air helps to cool you by evaporating perspiration.

- If you have a forced air heating system, try turning on your circulating fan. It can move cool air from the basement through the house.



Hot day air — Button up

Cool night air — Open up

REDUCE INTERNAL HEAT LOADS

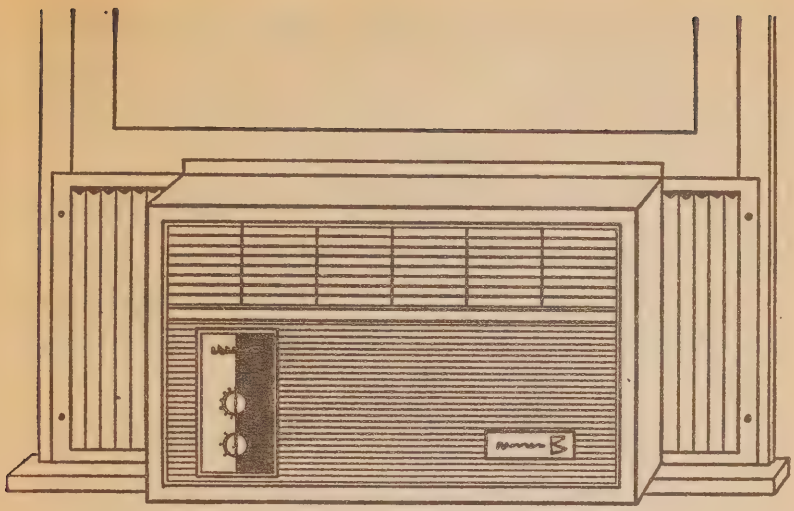
- There's enough heat coming in from outside. Don't generate more by using appliances unnecessarily.
- Turn off lights when not needed.
- Turn off television sets, radios and recorders when they are not in use.
- Do your vacuuming, ironing, clothes washing and dishes in the cool hours.

- Don't use the stove unless you have to. Try cooking in the morning or evening and serve cold but nourishing meals.
- Make sure that refrigerator and freezer door seals are air tight, and avoid leaving the door open longer than necessary. The cool air you momentarily gain will be more than made up for by the heat the refrigerator must reject in order to re-cool itself.
- Hang clothes out to dry. If you must use a clothes dryer, exhaust the hot air out-of-doors in the summer. (In winter, try exhausting electric dryers into the basement, using an old nylon stocking over the tube to catch the lint. Empty it often.)
- When you've had a bath or washed dishes, pull the plug right away. Get rid of the hot water. (In the winter of course do the opposite; let it stand for a while — better to heat the house than the sewers.)

IF YOU STILL NEED HELP TO KEEP YOUR COOL, LET'S TALK ABOUT AIR CONDITIONERS

TYPES AND SIZES

There are basically two types of air conditioners: room air conditioners (usually window-mounted) and central air conditioners, with various sizes of each. The room air conditioners are smaller and designed to cool one or several rooms. The central units go on your heating system and are designed to cool the whole house. They are larger, more expensive and generally more energy-consuming. A heating-cooling expert will size it to the needs of your home.



CHOOSING A ROOM AIR CONDITIONER

- Buy the proper size. Decide how much space you really need to cool (recreation room, bedroom?) and ask the salesman to show you the right size. Air conditioners are rated by Btu of cooling per hour and will probably be available in the range of 4,000 to 24,000 Btu per hour. (See Glossary for Btu definition.)
- Buy the most efficient unit in the size you need. You want the one that uses the least electricity (watt-hours) for a given amount of cooling. A convenient way of comparing is to use the Energy Efficiency Rating or *EER*.

What is EER?

EER is a convenient number that indicates the efficiency of an air conditioner. It's a measure of the amount of cooling achieved relative to the amount of electricity used. EER is determined by

dividing the Btu per hour rating of an air conditioner by the watts (power) it uses. For example, if an 8,000 Btu air conditioner consumes 1,000 watts,

its EER will be $\frac{8{,}000 \text{ Btu/hr}}{1{,}000 \text{ watts}} = 8.0 \text{ Btu/watt-hr.}$

Another model of the same capacity (8,000 Btu/hr) might consume only 800 watts. It is more efficient, since it accomplishes the same amount of cooling with less power consumption.

Its EER is $\frac{8{,}000 \text{ Btu/hr}}{800 \text{ watts}} = 10 \text{ Btu/watt-hr.}$

The higher the EER, the more efficient the unit and the less power it will consume. Since it is more efficient and better made, the unit will likely cost a little more but will probably be a better buy in the long run when you remember the energy savings it delivers.

Usually the information necessary for calculating the EER using the formula shown above can be obtained from the information plate on the air conditioner.

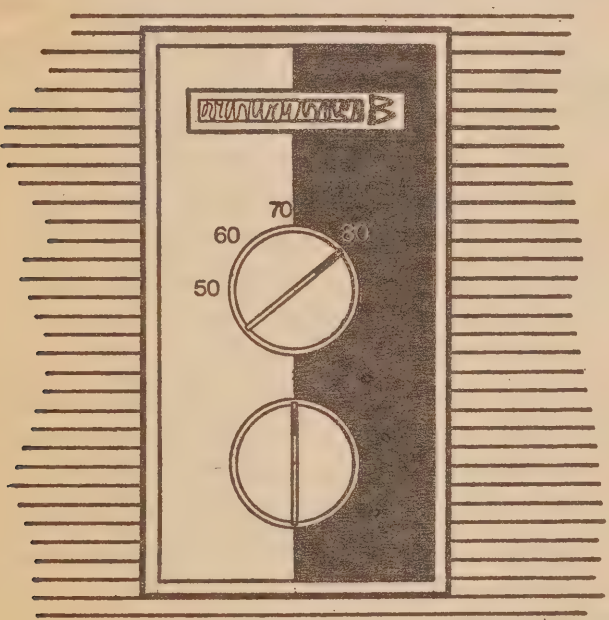
ENERGUIDE

Within a year all air conditioners sold in Canada will be required by the Department of Consumer and Corporate Affairs to bear ENERGUIDE labels. By indicating how much electricity each model consumes per month under typical operating conditions, the labels will make it possible to take energy consumption into account when making a purchase decision, as well as price and other features.

ENERGUIDE labels will also be developed for other appliances. Watch for them.

OPERATION IS A FAMILY AFFAIR

- First, make sure you have followed the ideas on Keeping Your Cool. They'll reduce the cooling load on your machine and the energy it consumes.
- Read the instruction manual carefully. Each member of the family should know how to operate the unit and agree on the indoor temperature.
- Temperature setting. This should be as high as possible, but still pleasant in the house. Try 80°F (27°C). Once you decide on the temperature, set the thermostat and don't change it. The higher you set it the more savings you'll make. It is the opposite of winter heating where you try to maintain the lowest possible temperature and still remain comfortable.



- During cool periods in summer months, turn off the air conditioner and open up the house to the fresh

breezes. It makes no sense to have the air conditioner turned on if the outside temperature is about what your unit is set at.

- Never have a window open and the air conditioner on at the same time. If it's cooler outside, then you don't need the air conditioner. If it's warmer outside then the warm air coming in the window just adds to the work of the air conditioner.
- If you go away on weekends and for holidays during the summer, turn off the air conditioner.

MAINTENANCE TIPS

You can carry out some maintenance checks yourself.

- Clean the dust and dirt off inside and outside coils before each summer cooling season.
- Be sure that the blower and electric motor on the unit are lubricated; follow the manufacturer's recommendations.
- Check the tension on the fan belt in a central forced air system; you should be able to press this down between ¼ and ½ inch. If more or less than this, change the tension by moving the adjusting screws found on the mounting frame that fastens the motor to the blower housing. If in doubt check the instruction manual.
- Check the filters on the unit and clean or replace them where necessary. In a central cooling system, the filters should be checked once a month as in the heating season. Make sure that shrubs and grass outside can't block the flow of air through the condenser and that the outside area is kept clean.
- During winter, either remove window-mounted units and seal the window, or seal the unit on both sides with plastic, wood or a piece of styrofoam. Tape it up well so that cold air won't infiltrate.

outside machinery

In this mechanized age, just about every home and garden maintenance project has a fancy tool for the job. Chain saws, hedge clippers, power lawnmowers, rototillers, grass trimmers, snowblowers and so on.

They may be the last word in ease and convenience, but each of them uses energy. Before you buy one, ask yourself if you really *need* it. The job may take a little longer without power help, but think of the exercise and sunshine you can gain, and energy you can save.

LAWNMOWERS AND ROTOTILLERS

- *Tune up for spring.* When the grass starts to turn green, put your garden equipment in top running order.

  The spark plugs should be cleaned, checked and replaced if necessary. Adjust the carburetor and be sure the choke is working well. Replace transmission oil if necessary and then start the machine. If there are problems you can't solve by yourself, take it to a qualified serviceman.
- *Watch your engine speed.* Don't run a gas-powered lawnmower at full speed unless absolutely necessary. Learn to "hear" your motor; gradually open the throttle until the machine is working at optimum efficiency.

  Warning: Never leave your machine idling for long periods or when you're not around. It's hard on the motor, wastes gasoline and is dangerous if there are pets or small children nearby.

- *Electric lawnmower.* Be sure to give it a spring check-up. The operator's manual will tell you where to squirt the oil and what type to use. Take off the hood of the motor and clean out any collected grass clippings. If you don't take this small precaution, the motor will have to work much harder than normal and could burn itself out.

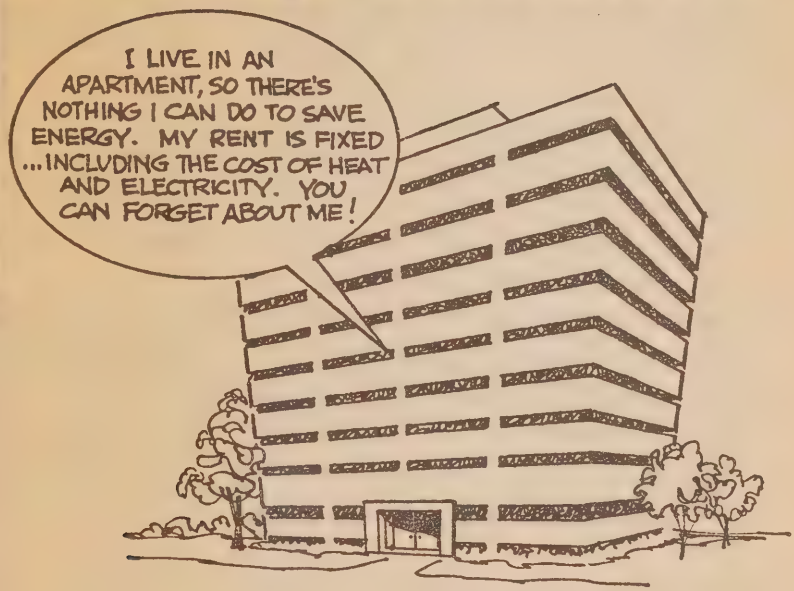
  Inspect the cord for breaks and cuts. Repair them with electrical tape.

  Warning: Don't use electric mowers when it's raining or on wet grass.

SNOWBLOWERS

- *Annual maintenance.* Give it the same annual check-up and care that goes into your lawnmower or rototiller.
- *Use only when needed.* Try to handle a light snowfall with a shovel. This is healthy exercise, saves gasoline, and lets you avoid breathing the fumes from the snowblower.
- *Save power.* Use only as much power as needed to remove the snow. Don't run it at full speed unless you've had a blizzard!
- *Cleaning.* Be sure the snow is cleaned off the machine when you're finished. Otherwise the machine can rust, especially around the carburetor. This will lower the efficiency and may waste gasoline.
- *Electric snowblower.* It deserves the same care as an electric lawnmower. Read your operator's manual for maintenance tips. Learn to listen for changes in the sound of the motor, so you don't ask too much of it in deep snow. The manual will tell you how much snow it can efficiently clear.
- *Try a shovel.* It takes only two drops of oil a year (to prevent rust).

so you live in an apartment...



No, we won't forget about apartment residents. Whether you live in a high-rise or smaller building, there are plenty of ways that you can save energy. Hopefully even if your rent is fixed the landlord will eventually pass on his savings. And remember that there are many other reasons to conserve energy even if you do not immediately benefit financially.

The two chapters, *Savings in the Kitchen* and *Electric Lighting,* apply directly to you. And if you're thinking about moving into a house, many of the other chapters have ideas that you'll want to know about.

Right now, let's look at some ways you can save energy in your apartment building:

CHECK YOUR APARTMENT HEATING

Do you find yourself frequently opening the windows because the apartment is too hot? Maybe the landlord has set the thermostat too high. If he follows the suggestions in the chapter on home heating — including lowering the thermostat — he'll make the building more comfortable, save fuel, and hopefully pass the saving on to you.

- *Individual thermostat.* If you have your own thermostat, try setting it for 68°F (20°C) during the day and five degrees lower at night. If the apartment is empty all day, leave the thermostat at the night setting and turn it up when you come in from work.
- *Central thermostat.* In many older, smaller buildings, there is only one central thermostat. If your apartment is often too hot, try closing off some of your heat outlets. How does this save energy? The heating unit will send more heat to the open outlets. These areas will warm up more quickly, so less use will be made of the heating unit.
- *Humidity.* If your heating is by forced warm air, ask the landlord if there's a humidifier on the furnace. If not (or if the building is heated by hot water, steam or electric heat) think about buying a small humidifier for your apartment. It will help you feel more comfortable, at a lower temperature setting.
- *Storms or double-pane windows.* Ask the landlord to install them. They'll help to keep the heat in which will mean a saving for the landlord and more comfort for you.

MEASURE YOUR ELECTRICITY

- *Separate meters.* You may have your own electric meter. If you don't know where it is, ask the land-

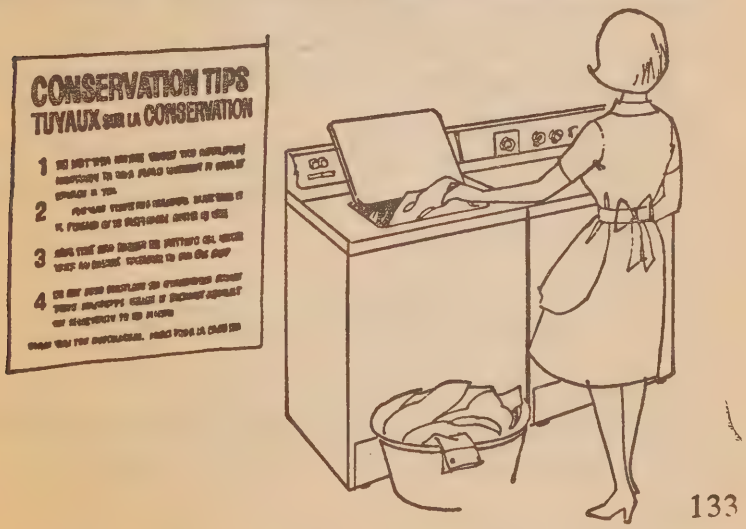
lord. First, make sure no other electrical sources are hooked up to your power supply. Turn everything off in your apartment (don't forget the refrigerator) and then look at your meter; the disc should not be moving. If it is, head straight for the landlord and find out what other outlets are on your circuit.

- *Master meter.* If you don't have your own meter it still makes good sense to develop a conservation ethic. Turn off lights that aren't needed, use your appliances wisely and so on. The two chapters, *Savings in the Kitchen* and *Electric Lighting* are full of energy-saving ideas.

SAVE ON HOT WATER

- *Read the chapter, Hot-Water Heating.*
- *Insulation.* Hot-water pipes throughout your apartment building should be insulated, so the water doesn't cool off between the boiler and your taps. If your hot-water taps have to run for a minute or so before you get any hot water, talk to your landlord. He's wasting energy!

GO EASY ON WASHERS AND DRYERS



- *Instructions.* They should be posted near washers and dryers so all tenants use them economically.
- *Full loads.* It takes as much energy to wash or dry a half load as a full load. So try not to do less than full loads.
- *Take clothes out of the dryer* as soon as they are dry enough to iron.
- *Hang small washings* up to dry in your apartment. It will add welcome humidity.
- *See the chapter, Savings When Using Appliances.*

THINK ABOUT AIR CONDITIONING

- *Do you really need air conditioning?* If you're out all day, evening breezes or a fan may be all you really need. You can keep heat out during the day by closing drapes and curtains, especially on the south or west side of the building.
- *Central air conditioning.* If your apartment building has central air conditioning, with individual controls, read the *Summer Cooling* chapter. Many of the ideas will apply.
- *Individual air conditioning.* If your building doesn't have central air conditioning, perhaps you're thinking about installing an apartment unit. Make sure you choose one that suits your needs. If it's too large you'll just waste energy.

  Check with your building superintendent about proper installation. Again, be sure to read the chapter on Summer Cooling.

SURPRISE THE LANDLORD

Talk over energy conservation with other tenants in your building. Band together and approach your landlord with ideas on how he can save energy. Suggest

that he replace inefficient systems, such as hot-water heaters that have a low recovery rate. You'll be helping him save money in the face of rising energy costs. Hopefully these savings will be passed along to you, by holding off rent increases.

For apartment dwellers, financial savings from energy conservation practices are likely to go in the first instance to the owner of the building. We suggest that tenant groups — either organized or informal — stress energy conservation with building management, and perhaps explore ways of returning the dollar saving to tenants. However remember that there are many reasons for saving energy which are not related to a personal dollar saving, and it still makes sense to conserve energy even if you do not immediately benefit financially.

- *Get your landlord a copy of this book.* Order a copy of *100 Ways to Save Energy and Money in the Home* for your landlord or building superintendent. Copies are available by writing to:

  100 Ways
  Box 3500
  Station C
  Ottawa K1Y 4G1

tips for cottage owners

For many of us, the Canadian way of life means "getting away from it all" on weekends to a lakefront cottage, cabin in the woods, or ski chalet.

How can you save energy on these vacation and weekend excursions? Well, you can start by doing many of the things you do at home: watch the lights, turn off the TV, use the stove economically and so on.

You can try to economize on travel to and from your holiday spot. Maybe two families in the same area can share the trips — like a car pool. Here are more ways to save:

SUMMER SAVINGS

- *Boats.* If you're near a lake, chances are you own a boat of some type. If you have a family that enjoys water skiing, you need a larger and more powerful motor. But you don't have to use this big one *all* the time. What do you use to go fishing early in the morning? Or to go on a little sight-seeing trip? A smaller motor is more economical and will get you wherever you want to go. Perhaps not as quickly, but you'll have more time to relax. And isn't that the whole idea?
- *Hot-water heater.* When you're heading home from the cottage be sure to turn off the hot-water heater. It's an energy waste to keep water hot that isn't needed, and it won't take long to heat up when you return.

- *Heating.* Some heating units, particularly electrical ones, can be turned off at the unit; others have a thermostat that says "warm." If the weather turns cool the heater will come on. This is a waste in summer if the cottage is empty. Check to see if your unit can be turned off completely; if not, switch it off at the main fuse-box.
- *Fall close-up.* If you don't use the cottage in winter, there are a few points to check when you leave for the last time in the fall. Drain the water from all taps. Defrost and unplug the refrigerator; be sure it's dry and leave the door slightly ajar. Turn off the main electric power switch as a double check that nothing has been left on.

WINTER SAVINGS

- *Insulation.* If you plan to use your cottage year-round, you'll probably need to improve the insulation. Follow the ideas in the earlier chapter, *Keeping the Heat In.* You should be able to do the work yourself.

  Before you start, find out how much insulation is in the building now, the R value you want, and the area to be insulated. If the floor has not been insulated, and you don't have a basement, you may need to take up some boards and blow insulation in underneath. An insulated floor will save dollars on your heating bill.
- *Heating unit.* Be sure the heating unit is big enough to do the job. If the unit is too small, you'll be uncomfortable and wishing you were home in the city. Get some professional help on this point.
- *Thermostat.* There are ways to save on energy which will put money in your pocket every weekend through

the winter. Set the thermostat at a comfortable setting, as you do at home, and turn it down at night. If you're going to be out all day, don't turn it up in the morning.

Be careful not to get too warm before you go outside. Above all, don't perspire because when you are outside the dampness in your clothing will quickly give you a chill.

- *Fireplace.* A cheery fireplace is also an energy waster. You lose heat up the chimney. But don't be discouraged — there are now units on the market that allow you to have a fire in the fireplace and still heat the room. If you are having a new fireplace installed be sure it has heat vents. (See the chapter *Keeping the Heat In* for details.)
- *When you're away.* Before you head home on a Sunday night, turn the heat *off* — either at the unit or the main power switch. If your water system is operating, you'll need *some* heat to keep the pipes from freezing, but you can still turn the heat way down. (When you return, move the thermostat up to the usual level. Don't set it higher because the building won't heat up any faster.)

  Remember to turn off the water heater each time you leave. What's the sense of paying to heat hot water if you're a hundred miles away?
- *Snowmobiles.* They can be a great help in the winter, but if you want to relax and get back to nature why not strap on a pair of cross-country skis or snowshoes? You'll get some good exercise, and see all the wildlife that goes into hiding whenever a snowmobile is near.

recycling

(and other simple ways of reducing your indirect energy consumption)

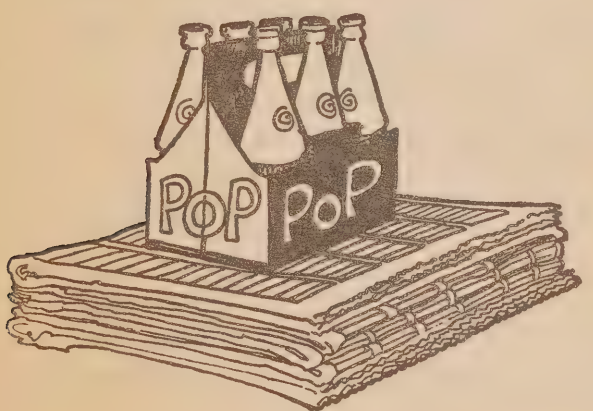
GARBAGE!

Most of us don't think much about garbage — but it's time we did. There's a lot more to it than a fat green plastic bag sitting by the curb. Or vegetable peelings sailing down the chute in your apartment building.

That's energy we're throwing away!

Did you know that much of the garbage we toss out could either be prevented or recycled?

Over-packaging and disposable items can be avoided. Newspapers can be made into wrapping paper and boxboard. Many glass bottles can be returned, others can be ground up to make new glass. Metal cans can be melted down for new steel. Vegetable peelings can go into a compost pile to make fertilizer.



What does all this have to do with saving energy?

Well, it takes energy to extract, manufacture and transport all of the products we consume — be they food, clothing, containers, paper or furniture. By avoiding the unnecessary ones and re-using the rest of them, we can bring about worthwhile energy savings in the industrial and transportation sectors of our economy. For example, by recycling steel we can save about 74 per cent of the energy needed to make new steel. For aluminum the saving is 95 per cent.

A returnable soft-drink bottle that makes many trips can save about 80 per cent of the energy required to make the equivalent number of throw-aways.

And if we don't buy widgets because we don't really need widgets, we'll save 100 per cent of the energy because another widget won't be manufactured to replace it.

And so the savings go. If we all pitch in to re-use, recycle and reduce unnecessary consumption, we'll bring about large energy savings for Canada.

Remember, too, that we'll reduce pollution and save money. The cost of garbage collection, for example, is rising dramatically. More garbage means more trucks, more men, more energy burned to haul the garbage away, more landfill and incinerators. These costs fall to the taxpayers. The more that can be recycled, the less garbage there will be.

Now perhaps you agree to this point. Yes, let's do something about solid waste in Canada — but where to start? Let's start with some shopping tips.

SHOPPING

- *Returnables.* Buy milk and soft drinks in returnable bottles — and be sure to return them. This type of bottle can average 20 trips; you save money (because

you get the deposit back) plus the energy needed to make new disposable bottles, cans or milk cartons. By returning them you also avoid the possibility of litter.

- *Shopping bags.* Take your own shopping bags (from previous trips) to the store and insist that the clerk use them rather than new ones. If you're just picking up one or two items, don't use a bag.
- *Avoid overpackaging.* You know the type. Razor blades come in bubble packages that look like the Houston Astrodome. Some food products come with two or three layers of paper, foil and cardboard. Who needs it? Steer clear of these overpackaged products — or find a place that sells them *without* the gaudy wrapping. Tell the store manager how you feel. Write to the manufacturer and let him know as well.
- *Avoid convenience foods.* Highly processed foods often come in elaborate packages. Try to use fresh vegetables where possible. The energy you'll use to cook them will probably be a lot less than the energy used to prepare, pre-cook and preserve a convenience item.

Buy your foods in bulk if possible, and take your own container. Country markets can be fascinating fun.

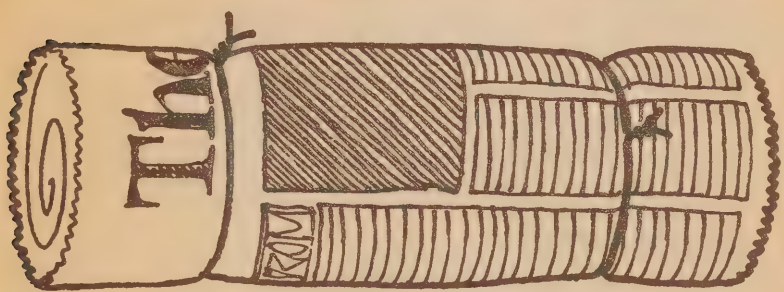
SHARING FOR ENERGY SAVINGS

- *Recycle furniture and clothing.* Don't throw out items that may still have some use. Take them to the Salvation Army and similar organizations, or to a second-hand store. This includes appliances and toys. Someone in your area can make use of them.
- *Return metal clothes hangers* to the cleaners every time you take in cleaning.
- *Share equipment.* Perhaps you and your neighbours can go *together* to buy equipment: lawnmowers, grass rollers, electric saws and such. You'll save money and Canada will save energy.
- *Try renting.* Why buy a rototiller or chain saw for a few days' work each year? Rent instead.

PAPER

- *Buy recycled paper.* When you're buying writing paper, paper bags, etc., make sure it is the recycled variety. Do the same if you're buying for a company or business. If more Canadians request it, the demand will expand and the entire paper recycling movement will be stimulated.
- *Use both sides.* Use both sides when you're writing a letter. Encourage children to do the same at school. If the teacher objects, see the principal and explain that you are encouraging your children to save energy. In fact, suggest that the entire school use recycled paper. *Each ton of recycled paper saves 17 trees, and energy.*

- *Recycle newspapers.* Save your newspapers and tie them in bundles. But don't make the bundles too big. Much of the collecting is done by children in cubs and brownies. Separate glossy magazines from newspapers. Many communities and local groups have paper pick-ups or depots. If there isn't one in your community, why not get the ball rolling.
- *Newspaper logs.* If you live in an isolated community, without paper pick-up, you can cut down on wood for your fireplace by using newspaper. Roll it tightly, about the same size as a log. Tie it with light wire. This tightly-rolled bundle of paper will last about as long as a log of wood and give off just as much heat.



KITCHEN

- *Disposables.* Don't use paper plates, cups or one-time utensils — even if you have a crowd in for a party.
- *Cloth vs. paper towels.* Consider using cloth rather than paper towels or serviettes.
- *Re-use food containers.* If you buy food in plastic or glass containers, don't throw away the containers. Wash them and use for storing left-overs, etc. You can even wash and re-use plastic bags.
- *Compost pile.* If you have a garden, how about starting a compost pile using your vegetable and fruit

scraps, grass clippings, etc. Many garden books will show you how to make the frame and how to start the pile. You'll have great fertilizer and humus for your garden.

- *Grow your own.* Backyard gardens can be very rewarding — good food, lots of fun, lower food bills, and hidden energy savings as well.

SEPARATING AND RECYCLING

Try to separate your garbage so the maximum amount of material can be recycled.

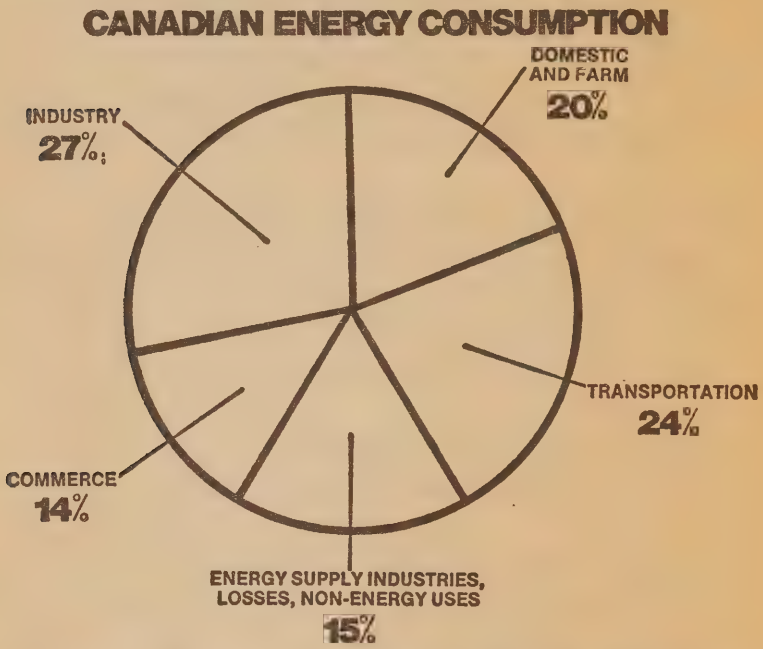
- *Newspapers.* Put these and other papers into separate bundles.
- *Cans.* When you're finished with cans, rinse them out, flatten them and set them aside for recycling. You may notice that right now different metals are used in cans. However, the cans of the future will probably be made entirely of steel which will make recycling easier.
- *Bottles.* If you can't possibly use bottles, and they can't be returned, take off the metal rings and caps and put them aside for recycling.
- *Collection or drop-off.* The actual collection of items for recycling will vary in each community. Some may be picked up during normal garbage pick-ups. In other cases you may have to take the bottles, cans, etc., to a central depot.
- *Do your own thing.* Not all communities have recycling programs. If you're without one, press your local council to start planning a strong recycling effort. Get involved in local environmental groups. Your efforts will benefit all concerned in the long-run.

A NOTE ON RECYCLED PAPER

Unfortunately this book is not printed on recycled paper for the single reason that *no* recycled newsprint is presently manufactured in Canada. If it had been available, this would have been done. Recycled de-inked bond and mimeo paper is available in Canada and future conservation publications will use this type of stock. It is hoped that a combination of consumer demand and government programs will result in the availability on the Canadian market of a large range of paper grades containing recycled post-consumer waste.

WHY CONSERVE ENERGY?

While this book concentrates on energy savings in the home, it is important to put the domestic sector in perspective. The consumption of energy in the form of electricity and heating fuel in Canadian homes and farms represents about one fifth of the total energy consumption in Canada. Gasoline for private cars represents a further large share of the transportation sector.



This means several things. First, saving energy around the home can have significant impacts on the national scene. If everyone cuts his domestic consumption by only 10 per cent through furnace tuning, insulation, lower temperatures or other measures, the result would be a cutback of about 2 per cent in total national consumption. While this may not seem large in percentage terms, it is actually a tremendous energy and dollar saving for Canada.

Second, the other sectors of our economy are also large energy users; both industry and transportation surpass residential consumption. This means that there is both an opportunity and a responsibility for conserving energy in those sectors. Accordingly, the Government will be implementing a combination of voluntary and mandatory measures to bring about significant savings in these areas. Each of us can also contribute by carrying our conservation concerns over to our job. Whether you drive a truck or manage a business, work in an office or a factory, there are numerous ways that you can conserve energy each day. Take a lead from the measures in this book and start a conservation campaign at work.

Third, as private citizens we consume almost 20 per cent of Canada's energy budget in our homes and over half of the transportation energy in our cars, giving us a total direct consumption of about one third of the total. The other two thirds of Canada's consumption is used to produce the goods and services that we as consumers demand. This means that our potential for conservation is not limited to that one third of the total energy budget that we consume directly. By careful purchases, consumer action, recycling and choosing energy-efficient travel modes we can have an impact on that other two thirds.

Almost all of us believe to some degree in conservation. For some people, it is a simple matter of saving money; for others, a husbanding of resources now so that we will not find ourselves short in the future. For yet other people, conservation represents an ideal, a way of life to which we should aspire. Whichever is your view, there are many sound reasons to support energy conservation as an important new direction for

Canadian energy policy. Let us focus briefly on just the most obvious of these.

RESOURCES

First, there is the sheer physical volume of energy that is being demanded in a world of ever more people, of higher incomes and of more technology. With every increase in our rate of consumption, in Canada as elsewhere, it becomes harder to find, produce and transport the necessary energy materials. For the first time we are in a position where projected future demand levels cannot be satisfied by conventional energy sources. Canada will face possible shortages of oil and natural gas within the next decade unless non-conventional or potential frontier resources can be developed and delivered in sufficient quantity. Even future electricity supply is not assured. Feasible hydro sites are now almost totally developed and uranium reserves are limited.

COSTS

Second, even if we could locate energy resources of suitable quantities and qualities, their costs would be monumental. It has been estimated that to meet the capital requirements for energy in Canada to 1985 alone, we will have to spend over $100 billion, that is about $20,000 per existing household just to supply energy.

This effect gets worse with time because, as we move to lower quality and more remote sources of energy, it will cost us more and more energy to obtain energy. That is, since we have to invest not only dollars but also energy units in order to mine coal or tar sands, drill wells, operate pipelines or whatever, the net costs of energy delivered to the consumer will be still higher.

The impact of this on our economy will be severe, both in terms of inflation and because it means fewer dollars for schools, hospitals and other industrial projects. In effect, it implies a return to the situation in which Canadian investment would be concentrated in the resource sectors of the economy.

In view of the resource and cost factors, conservation offers a low-cost and low-risk alternative to continued high-demand growth.

ENVIRONMENT

Third, assuming the resources were available and could be produced at a cost that we were willing to pay, to produce them and then consume them would involve large-scale environmental impacts.

Obviously to the extent that we conserve energy and defer or cancel energy development plans the environmental impacts of production and transportation can be avoided. Moreover in almost every instance sound energy conservation at the point of use also supports environmental protection. True, in some cases environmental protection techniques seem to require more energy, but in most cases this arises only when such techniques are added on to the end of an existing process. The emission devices on automobiles are good examples of this approach. When more thought is given to the process as a whole, the apparent conflict between energy conservation and environmental protection usually disappears.

In summary, energy conservation can be viewed as the purest form of environmental protection.

SOCIAL BENEFITS

Finally let us examine the idea of quality of life. This is perhaps an over-used phrase, but the fact that it is

over-used means that, for many Canadians, there is a feeling that our higher incomes and greater wealth have not been producing all that we had hoped that they would. For example, we now have larger, more powerful automobiles, but it takes us just as long to get to work and there are ever more aggravations on route. Our luxurious homes are burgeoning with appliances, our garbage bags burst with waste from the affluent society. But has all this consumption and convenience brought us closer together or has it alienated us from the natural world and each other?

There is sound evidence to think that most indications of quality have begun to turn downward, that they are by no means as closely related to energy consumption as we once thought. Indeed, it now seems that efforts at moderating our energy consumption — smaller cars, more mass transit, better built houses, less waste production, more personal involvement — will contribute to the quality of life at the same time as they save energy.

There are still other reasons to support a serious and continuing effort at energy conservation which cannot be discussed fully here. Energy conservation is likely to require the substitution of labour for capital and will thus account for an increase in jobs in Canada. By avoiding the need for enormous volumes of imports, energy conservation will reduce the dangers of international blackmail and confrontation. And so forth.

Most of us are aware that such benefits exist, though we perhaps do not often separate them into neat categories. Individually, any one is probably sufficient to justify increased efforts at conservation. Together they indicate that conservation will be fundamental to the Canada we are all trying to build.

WHAT IS ENERGY?

A Glossary of Commonly Used Terms

It is almost impossible to pick up a newspaper or magazine today and not read about energy. Many products are also being advertised with a new energy terminology.

Here are some explanations of the most commonly used terms:

ENERGY

What is it? That potential force which gives us the capability to do mechanical work or to produce a change in temperature (that is, to heat or to cool).

What form does it take? Energy can take many forms, such as mechanical motion (called "Kinetic energy"), temperature difference between two objects ("heat energy"), and the flow of electricity ("electric energy"). "Potential energy" is mechanically stored energy, as in the tension in a spring, or water stored behind a dam, or chemically stored energy, as in a fuel.

What is the relationship between energy and power? Power is the rate at which energy is used or the rate at which work is done.

Where does our energy come from? Nearly all energy available on earth ultimately derives from solar radiation. This radiation makes plants grow and thus provides food for men and animals; over many thousands of years plant debris also forms our fossil fuels (oil, coal). (Carbohydrate in food itself is a form of fuel which is "burned" in the body.) The radiation makes water vapour rise, which causes rain and snow to fall and rivers to run. It gives rise to variations in atmo-

spheric pressures and thus to winds. The ocean tides — which are a potential source of energy — are caused by the attraction of moon and sun rather than by radiation, but without heat the oceans would be frozen solid. The amount of radiation received by the earth from the sun is staggering. On the average each 1½ square miles of the earth's surface each day receives the heat equivalent of a Hiroshima-type atomic bomb. Only the nuclear energy stored in uranium and thorium is not derived from solar radiation.

How is energy measured? The energy content of a system can be measured in many ways, such as by measuring the speed and weight of an object; by measuring the temperature increase produced in water; or by measuring the current, voltage, and period of flow of electricity.

How do we specify amounts of energy? The quantity of energy can be expressed by a variety of equivalent units which apply to the mechanical, heat, or electrical forms of energy. The most commonly used units of measurement which you will see in product advertisements, on labels, and elsewhere are:

British Thermal Unit (Btu). One Btu is the energy required to increase the temperature of one pound of water by one Fahrenheit degree. For example, it takes 375 Btu to heat one quart of tap water to boiling. How is that figured? One quart weighs 2½ pounds. Assume tap water temperature is 62 Fahrenheit degrees. Boiling point is 212 Fahrenheit degrees, so needed temperature rise is 150 Fahrenheit degrees. The energy required is 2½ x 150 = 375 Btu.

Kilowatt (1,000 watts). A unit of electrical power indicating the rate at which electrical energy is being produced or being consumed.

Kilowatt hour (1,000 watt-hours). A unit of electrical energy equal to the energy delivered by the flow of one kilowatt of electrical power for one hour. For example, a 100-watt bulb burning for 10 hours will consume one kilowatt hour of energy.

Energy efficiency. The amount of useful work or product divided by the fuel or energy input. For example, in electrical generation it is the amount of electricity produced per unit of fuel consumed. For an air conditioner it is the amount of cooling provided per unit of electricity used.

Energy shortage. This occurs when the supply of fuel is not enough to satisfy the demand for energy, such as when there is not enough gasoline to meet public demand.

Electrical power shortage. The supply of electricity is controlled by the utility, the consumption of electricity by the customers. When the customers call for more electricity than the utility can deliver, there is a power shortage. Such shortages are likely to occur in winter, and especially around Christmas, when the peak demand comes in early morning and late afternoon/early evening. Consumers can help at such times by reducing their use of electricity as much as possible.

Brownouts. During periods of acute electrical power shortage, utilities reduce the voltage on the power lines so that the amount of power delivered to each customer is cut back. These voltage reductions or "brownouts"

can lower the performance of some electrical appliances and equipment. Brownouts are measures of desperation and are an undesirable solution to a power shortage.

Blackouts. The failure of an electric power system is often caused by storm damage or equipment failure. Blackouts can also result from severe power shortages which overload the utility's capacity to deliver power to an area.

COMMONLY USED ABBREVIATIONS

bbls _____ barrels (a barrel contains 35 imperial gallons)
kw _____ kilowatt
kWh _____ kilowatt hour
Mcf _____ 1,000 cubic feet (of gas)
Mw _____ megawatt, 1 million watts
Btu _____ British thermal unit
therm_____ A unit of energy used for natural gas, equal to 100,000 Btu

Numerical abbreviations

Very often you will see energy expressed in numerical form — e.g., 10^6 Btu. This is a convenient way of expressing the large numbers such as millions, billions, or even quadrillions involved in measuring energy, instead of using many zeros. It is in a formula that indicates the multiples of 10 used to arrive at these large numbers. For example:

$1{,}000 = 10 \times 10 \times 10 = 10^3$ (thousand)
$1{,}000{,}000 = 10 \times 10 \times 10 \times 10 \times 10 \times 10 = 10^6$ (million)

ENERGY CONVERSION TABLE

To convert from	*to*	*Multiply by*
Kilowatt hour	Btu	3,412.8
1 ton bituminous coal	Btu	25,200,000
1 bbl crude oil	Btu	5,803,000
1 bbl residual oil (No. 5)	Btu	6,290,000
1 gallon gasoline	Btu	150,000
1 gallon No. 2 fuel oil	Btu	166,600
1 cubic foot natural gas	Btu	1,030
1 Mcf natural gas	Btu	1,030,000
1 therm natural gas	Btu	100,000
1 Btu	kWh	0.000293

SEND "100 WAYS" TO A FRIEND

If you would like to have another copy of "100 Ways To Save Energy And Money in the Home" or would like to send one to a friend fill in the address details below and send to:

100 Ways
Box 3500
Station C
Ottawa, Ontario
K1Y 4G1

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FEEDBACK

Once you have had a chance to read the book, and possibly put some of the ideas into practice, we would like to receive your comments on "100 Ways."

Was it useful? ..... Yes_____ No_____

Was it easy to read? ..... Yes_____ No_____

Was it easy to understand? ... Yes_____ No_____

Was it too technical? ..... Yes_____ No_____

Or was it too simple? ..... Yes_____ No_____

Did you learn to think about energy conservation? ..... Yes_____ No_____

Did the book give you adequate information on ways to save energy? ..... Yes_____ No_____

Did you do anything about saving energy in your home? Yes_____ No_____

What were the results?

_____

_____

_____

_____

Did the book change your perceptions of:

Energy ..... Yes_____ No_____

Yourself ..... Yes_____ No_____

Your home ..... Yes_____ No_____

Society ..... Yes_____ No_____

How many people read
your copy of 100 Ways? ... _____

Did you read it all
or just sections? ..... All_____Sections_____

If just sections, which
ones did you read? ..... _____

_____

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_____

Other comments

_____

_____

_____

_____

Send to:
Feedback
Office of Energy Conservation
Department of Energy, Mines and Resources
580 Booth Street
Ottawa, Ontario
K1A 0E4

OTHER BOOKS ON ENERGY CONSERVATION

The Billpayer's Guide to Furnace Servicing tells how we can keep our oil and gas furnaces in tip top shape so we can save money and Canada's energy resources. A properly tuned furnace will save money, reduce pollution, be safer and conserve energy.

The Garbage Book is OCE's third major publication and helps us realize that it takes energy to produce and dispose of garbage. The less we use and discard the more we save. We can all save energy and money by throwing out less.

Keeping the Heat In is a complete do-it-yourself manual telling us how to re-insulate our homes to save money and energy. Much of our resources are wasted by "leaky" houses. Many home-owners can cut their heating consumption in half by following the advice in this book.

The Car Mileage Book is our most recent publication. It tells us how to buy, drive, and maintain our cars so

they are more reliable and use less fuel. We can cut the gas we use by as much as 25% through careful driving and proper maintenance.

To receive any of the books, check the appropriate box and mail the coupon below.

Please send:

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